AN EXAMINATION OF SPECIAL EDUCATION INSTRUCTIONAL PROGRAMS FOR ENGLISH LEARNERS IN NEW YORK CITY SCHOOLS

by

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ABSTRACT

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English Learners (ELs) represent one of the fastest-growing groups among the school-age population in the United States. However, there have been significant achievement gaps between ELs and native English-speaking students in all grades and content areas. The gap only widens when EL students with a disability are considered. This study built on the existing literature by examining longitudinal data that tracked the academic achievement outcomes of ELs classified with an educational disability who attended three special education instructional programs rather than linguistic instructional programs, and evaluating whether these programs were differentially effective for students of different ethnic backgrounds and type of disability. The programs included General Education (GE), Integrated Co-Teaching (ICT) or Collaborative Team Teaching (TT), and Special Education classes (SE).

Using existing data from the New York City Department of Education, the analytic sample for this study looked at one cohort consisting of approximately 2,297 ELs who entered third grade during the 2006-2007 school year and followed them through the

2015-2016 school year when students were expected to be in the twelfth grade. Academic achievement in ELA and math were measured by the Grade 3-8 New York State ELA and math standardized exam scores. Achievement was also measured by graduation status as well as type of diploma earned upon projected year of high school completion.

A three-level linear mixed model (LMM), logistic regression modeling, and cross-tabulations were used to analyze the dataset. Overall, the results from the present study supported findings from previous studies indicating that students who have the opportunity to engage with typically developing peers display better long-term academic achievement outcomes. Nonetheless, consistent with prior research, increased gaps between ELs and non-ELs as well as Disabled students and their Non-Disabled peers were noted.

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Mesi tout moun. Mwen vrèman apresye èd nou!

L. M.

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INTRODUCTION

Background

School-age children recognized as culturally and linguistically diverse (CLD) comprise a mounting proportion of the student population in the United States, with English learners (ELs) representing the fastest growing segment. In the past 40 years, while the overall population of students in school increased by approximately 10% across the nation's school districts, the number of ELs in public schools increased by 95% (Kindler, 2002). In at least 15 states, the enrollment of these students increased 200%, with the geographic distribution of these students concentrated in urban areas (National Clearinghouse for English Language Acquisition [NCELA], 2002). Today there are 4.8 million ELs in public schools who speak more than 400 languages, though roughly 80% of the students speak Spanish as their first language (National Center for Education Statistics [NCES], 2015).

Given the growth of the EL population (shifts in demographics) in the United States, over the past four decades, systemic changes in the achievement among the overall student population have also emerged. According to national testing agencies, ELs typically receive lower scores than non-ELs on academic assessments. For instance, on the math and reading parts of the National Assessment of Educational Progress (NAEP,

also known as "The Nation's Report Card"), the difference between ELs and non-ELs is roughly one standard (NCES, 2016). To some degree, these differences could be confounded by socioeconomic status; however, research has shown that there are high correlations between language status and academic achievement when controlling for socioeconomic status (Fuligni, 1997; Kieffer, 2010; Reardon & Galindo, 2009). These gaps increase even further when ELs classified with an educational disability are accounted for (American Psychological Association [APA], 2012).

Despite a large body of research on the topic of ELs, there continues to be uncertainty about how to best provide instruction and access to EL curricula in this discipline. Also, an unclear role of special education in remediating learning difficulties continues to exist. Subsequently, there is much variability across school districts and states in the types of programs available to ELs (National Academies of Sciences, Engineering, and Medicine, 2017). The current available literature tends to focus on the overrepresentation of ELs in special education, which is frequently based on evaluations conducted in English, following school instruction that has not been modified to their language needs or status (Ortiz, 1997, 2002). Only a handful of research is available that describes the characteristics of ELs who are correctly identified as having an educational disability, to assist IEP/referral teams as they make eligibility and placement decisions. In addition, little research addresses the length of instructional programs students are placed in and the long-term effect or outcomes on the students' academic achievement (Slavin, Madden, Calderon, Chamberlain, & Hennessy, 2010). In light of these trends, it is important to ascertain effective instructional methods and programs for ELs with a disability, which will have positive long-term results. Therefore, this study was designed

to investigate the differences in academic achievement trajectories from elementary (third grade) through high school among English Learner students in special education instructional programs who are attending schools within a large school district in the northeast part of the United States.

Statement of the Problem

The numbers of EL students have increased at nearly seven times the rate of total student enrollment in public schools in the United States. (NCELA and Language Instruction Educational Programs, 2010). With this pattern, state examinations have become more demanding and school districts are being held accountable for the educational performance of their students more than ever before. By 2025, ELs are expected to be 25% of students born in the United States (U.S. Department of Education [USDOE], 2006). This population of students is a tremendously diverse group representing a range of languages, cultures, ethnicities, nationalities, educational experiences, and abilities. For example, as of 2002, nearly 10% of the total EL population in U.S. public schools were also diagnosed with a disability (Zehler et al., 2003). With this current pattern, ELs with disabilities will also encompass a considerable share of students being educated in the United States in the future. Despite these demographic trends, research has given minimal attention to this segment of students.

Comprehensive research studies of disproportionate representation (Donovan & Cross, 2002) and, more recently, Travers, Tincani, and Krezmien (2013) have revealed complex patterns of over-, under-, and proportionate representation affected by many factors. These factors include gender, ethnicity type and race, geographic location,

differences through states in eligibility criteria for different types of disability, and variations in the formula for explaining disproportion. These studies, however, are inclined to be limited in focus, typically examining matters involving referral rates to special education (Samson & Lesaux, 2009), the referral process itself (Klingner & Harry, 2006; Ortiz et al., 2011), as well as specific language instruction and literacy interventions with the objective of improving student performance (Gersten et al., 2007).

Several of these studies have been notable in their advocacy for ELs with disabilities, ensuring that ELs are not disproportionately denied access to the general education setting and overrepresented in special education (receive real but not bare opportunities). These studies, however, have not focused a great deal on what that education is like for the ELs once they are referred. A good amount of research pertains to the misidentification of children who are both culturally and linguistically diverse being placed into special education programs due to the improper use of norm-referenced assessments used to evaluate students (Kimani, 2014). Many studies in the current literature have also addressed the accomplishments of bilingual children attending various bilingual language programs. However, there is not much information about the achievement or failure of specific instructional special education programs available to EL learners (Myers, 2009). As the number of EL students in America continues to grow, along with the standards and calls for accountability at both the state and federal levels, guidelines on how best to address the educational needs of ELs are necessary.

Purpose of the Study

The No Child Left Behind (NCLB) Act of 2001 required that ELs meet the same federal requirement standards by which non-EL peers were assessed, despite English language proficiency status (Smiley & Salsberry, 2007). With the new legislation, under the Every Student Succeeds Act (ESSA), states must also assess the English language proficiency of ELs, provide reasonable accommodations for them on state assessments, and develop new accountability systems that include long-term goals and annual indicators for all students, including student subgroups such as ELs and ELs with disabilities. A major objective among researchers in the U.S. education sector involves increasing the research work pertaining to the development of more appropriate instructional interventions that focus on the persistent achievement gap in ELA and mathematics between ELs and non-ELs (Proctor, Dalton, & Grisham, 2007). At the same time, in order to receive federal assistance under NCLB and, more recently, ESSA, states, school districts, and schools are responsible for reporting how different subgroups of students demonstrate subject matter knowledge and skills in ELA, mathematics, and science.

Data from the Nation's Report Card (USDOE, 2011) revealed a significant discrepancy in ELA and math standardized assessments between ELs and their native English-speaking peers. In addition, ELs are more likely than any other group of students to drop out of high school. New York State has one of the fastest growing populations of ELs in the country, with over 248,000 (8.8%) students enrolled in its schools (New York State Education Department (NYSED), n.d.). According to the NYCDOE, 159,162 students were identified as EL in 2011, comprising about 14% of the city's school student

population. Only 48% of EL students graduated high school in 2011. Additionally, 19% dropped out, and 34% did not graduate within 4 years, compared to native speakers of English where the graduation rate was 71%. Five years later, only 41% of EL students graduated high school in 2016. Additionally, 22% dropped out and 36% did not graduate within 4 years, compared to native speakers of English where the graduation rate was 71%. Current statistics are worse for students with disabilities in some categories and suggest that the practices of educating EL students with disabilities need to be further evaluated and addressed (NYCDOE, 2016).

Therefore, the purpose of this study was to determine the effectiveness of instructional programs designed to serve English learners with an educational disability attending public schools within New York City (NYC), a large school district in the northeast part of the United States. Specifically, this present study attempted to determine the degree to which EL students, enrolled in special education programs in NYC schools, achieve academically on the ELA and Mathematics state exams. Achievement was also measured by graduation status as well as type of diploma earned upon projected year of high school completion. Since NYC has one of the largest school districts (made up five boroughs and 32 communities) in the United States, information and results that are obtained from this research will be helpful to other urban school districts to differentiate programs for students with disabilities. It is also important to determine, long term, the extent to which these programs have become a contributing variable in the students' academic achievement.

This study also examined the impact of other student variables such as gender, socioeconomic status, ethnicity, and type of disability on the dependent variables. An

analysis using Linear Mixed Methods (LMM) attempted to isolate the variable of placement in the special education programs. However, the examination of these other student variables was necessary because previous research has shown that these variables have an impact on academic achievement, specifically student achievement scores (Hill, Bloom, Black, & Lipsey, 2008). In addition, an exploratory Propensity Score Matching (PSM) approach was also attempted in conjunction with the LMM approach. Results are not presented in the main paper, but a description of the methods and results can be found in Appendix A.

Research Questions

In this study, the gaps mentioned previously in the literature were addressed by using quasi-experimental methods to answer four main research questions:

1. When controlling for disability type, ethnicity, gender, and SES, what are the long-term differential effects of instructional program type on English Language Learners classified with an educational disability and their academic trajectories in mathematics and ELA, through middle school, as measured by the NYS assessments?
2. Do these academic trajectories by program vary by ethnicity or type of disability?
3. What are the differential effects of instructional program type on English Learners classified with an educational disability and their graduation rate?

4. What are the differential effects of instructional program type on English Learners classified with an educational disability and the type of diploma earned?

These questions are related to the larger question of whether specific instructional program types actually contribute differentially to academic achievement, as measured by standardized tests and graduation rates after demographic variables are controlled for. Further, they speak directly to the contentions that these various special education instructional programs are effective and justified as a policy plan for school accountability and the long-term academic achievement of EL students.

Significance of Study

For states, school districts, schools, and society in general, having appropriate educational policies in place for ELs is of significant importance. According to Padolsky (2004), the enrollment of school-age language minority learners in English Learner programs increased by 95%, while enrollment of the overall population of students increased by only 12%, between 1991 and 2002. Additionally, results on national assessments reveal a significant achievement gap, where ELs have difficulty achieving academically at the same levels as non-ELs (NCES, 2004). Notably, research has indicated that this is the case for ELs while attending specialized language instructional programs. Consequently, the NCLB Act of 2001 was put in place to add pressure on school districts to increase the academic achievement of ELs in subject area content (Ragan & Lesaux, 2006). Therefore, improving the academic achievement of ELs is a major educational goal in the United States (Daniel, 2008).

This study offers educators an opportunity to explore the type of supports and/or interventions that might be most effective for ELs, a population whose rising numbers necessitate that educational researchers examine the instructional programs offered to ELs. Thus, this study contributes to the knowledge base regarding the representation of EL students with disabilities through the use of a sample of identified ELs from the NYC school district. Specifically, using existing data from the NYCDOE, this study was designed to examine a depiction of special education students identified as ELs and the academic progress made based on the instructional special education programs in which they were placed. This study built on the existing literature by examining longitudinal data that track the academic achievement of ELs with an educational disability in the areas of math and ELA. In addition, this study provides insight into the services and settings needed to promote the long-term academic success of ELs with an educational disability.

Design of the Study

This study employed a descriptive and quasi-experimental design to determine the relationship between instructional programs designed to serve ELs with an educational disability and their longitudinal academic outcomes through high school. This is due to the fact that it is not possible to develop an experimental design with randomized assignment of subjects for treatment and control groups. Therefore, a three-level hierarchical linear model (HLM) or linear mixed model was used to answer the research questions previously outlined.

The geographic location consists of the five boroughs of New York City and their 32 community school districts. The independent variable for this study was the three types of instructional program (i.e., General Education, Integrated Co-teaching, Special Education Community School or Specialized School). The academic achievement of EL students with an educational disability attending the programs within the district was reviewed. The dependent variables consisted of the English language arts and math academic standardized scores obtained on the state-level assessments administered to students each year. In addition, graduation status as well as type of diploma earned (i.e., Local, Regents) within 4 years of entering high school were determined.

The relationship between these variables and student performance on the New York State Assessment for ELA and mathematics is unknown. However, other student-level background variables, such as classification of disability, gender, ethnicity, and social economic status, were included in the sample. Prior research has shown that variables such as socioeconomic status (Coleman et al., 1966; Mickelson & Bottia, 2010; Schwartz, 2011); ethnicity (Coleman et al., 1966, Mickelson, Bottis, & Lambert, 2013); and gender (Cheema & Galluzzo, 2013) influence student achievement.

These background variables were used for control purposes. In addition, these variables were used for an exploratory propensity score matching procedure described later in Appendix A. The program type effect on individual student ELA and mathematics achievement was estimated, using a three-level growth curve model in a hierarchical linear model framework for the main part of this study. Cross-tabulations and logistic regression were also used to determine the probability of ELs graduating within 4 years upon entering ninth grade and the type of diploma earned.

Theoretical Foundation

In the United States, for some, equal educational opportunity has long been thought to be a moral right for all students, including ELs who have special education needs. According to Coleman (1975), the topic was focused on whether such equality entails equality of input of resources (i.e., student-level supports) or equality of the results of schooling. Coleman contended that equality is not always present in the equality of educational opportunity. He implied that according to the usage of the terms by the Supreme Court, educational outcomes leading to the equality of adult opportunity is more suitable than equal educational opportunity. Coleman described education as not an end in itself, but a means to an end. Furthermore, equal educational opportunity denotes opportunities later in adulthood rather than the educational process itself. Understanding the difference between the equality of input of resources and the equality of results of schooling (educational outcomes) is necessary to determine how education could become equal for all. Education is essentially a channel that students must travel through in order to get to equal opportunities as adults. In order to have these equal opportunities later in life, students must take advantage of these means by completing their schooling.

Howe (1997) further developed Coleman's theory by reviewing Dennett's (1984) distinction between "bare and real opportunities." Bare opportunities are unimagined and unrecognized as an opportunity to the agent (i.e., student and parent), who is unaware of it, as those who possess it are typically deprived of the necessary information to ever exercise it or to even know that it exists (Howe, 1997). A real opportunity is defined as an opportunity that the self-controller (i.e., parent and/or student) is made aware of in time to act. Equal educational opportunity is a link in an opportunity to obtaining other goods in

society such as a salary, work, and/or political power. Howe stressed that the strength of the educational link determines the overall strength of the opportunity chain; thus, in an opportunity chain, various opportunities open to an individual are determined by the quality of education he or she receives (Cadarenau, 2016).

Howe (1997) observed that a problem arises when it comes to providing children with equal educational opportunities, as school-age children lack the ability for active planning regarding their education. Several educational ends have to be realized in order for further opportunities to exist. Educational opportunities will become bare and not worth imparting if those opportunities are thought of as separate episodes rather than as a chain of opportunities. Therefore, with regard to EL students with disabilities, it is up to their parents, the school, or both, to advocate for them to ensure that in the future the students can gain the skills necessary to exercise self-determination and opportunity for themselves. In the case of this present study, the programs and services that EL students with disabilities receive are considered a bare opportunity, as they are not given the necessary information to ever exercise it or to even know that it exists because of the organizational barriers in place.

Coleman and Howe asserted that educational opportunities need to be available to all children educated in the United States. Children are unique and may learn differently, but should be provided with opportunities to be successful. In order to be successful, parents first need to be educated about the opportunities available to their children. The unique needs of each individual child, especially those children who are ELs with disabilities, then should be considered. Finally, school educators need to comprehend and

implement the laws that are in place to protect the rights of EL students with disabilities, so that they may have access to the various supports and services they need.

Conceptual Foundation

For this study, the conceptual framework which directed the collection and analysis of the data stemmed from IDEA, NCLB, and ESSA. Through IDEA, students with disabilities are to be educated with non-disabled peers, have parental involvement, and take standardized assessments (educational links associated with the opportunity chain). In addition, NCLB and ESSA have stressed not only access to the general curriculum, but access to all state-mandated tests for students identified for special education services. As a result of NCLB and more recently ESSA, schools have tried to improve test scores for students with disabilities as well as graduation rates in order to meet higher standards (Thurlow, Cormier, & Vang, 2009). Research has shown that students with disabilities do well in inclusive education environments. However, determining which specific instructional program or educational environment supports the needs of EL students with disabilities while also offering them a free and appropriate public education is equally important.

New York State (NYS) uses the English Language Arts (ELA) and mathematics (math) exams to measure students' knowledge of the academic curriculum from Grades 3-12. The scores provide benchmarks for evaluating schools, including graduation rates. The testing scores also inform the public about the yearly progress of schools. When attentive about the implication of these benchmarks and indicators, parents of EL students with disabilities (as well as all students) are able to make informed decisions regarding an appropriate educational setting/program for their children. School and district

administrators can also utilize the data results to make informed modifications in their respective educational settings. Similarly, administrators are able to make modifications and implement accommodations for EL students with disabilities in order to improve their test scores and graduation rates.

Overall, the conceptual rationale for this study, illustrated in Figure 1.1, was based on the input-output framework model. Chapter II discusses the student background variable "inputs" that have been known to contribute to student academic achievement outcomes. Some of these variables or factors include classification of disabilities, gender, ethnicity, and SES. These "inputs" are categorized by student-level variables. In addition, O'Connor (2010) described several different types of learning environments to improve student achievement and outcomes according to test scores. The "output" variables for this study included student academic performance on the NYS Assessments in ELA and mathematics, on-time graduation status, and type of diploma earned.

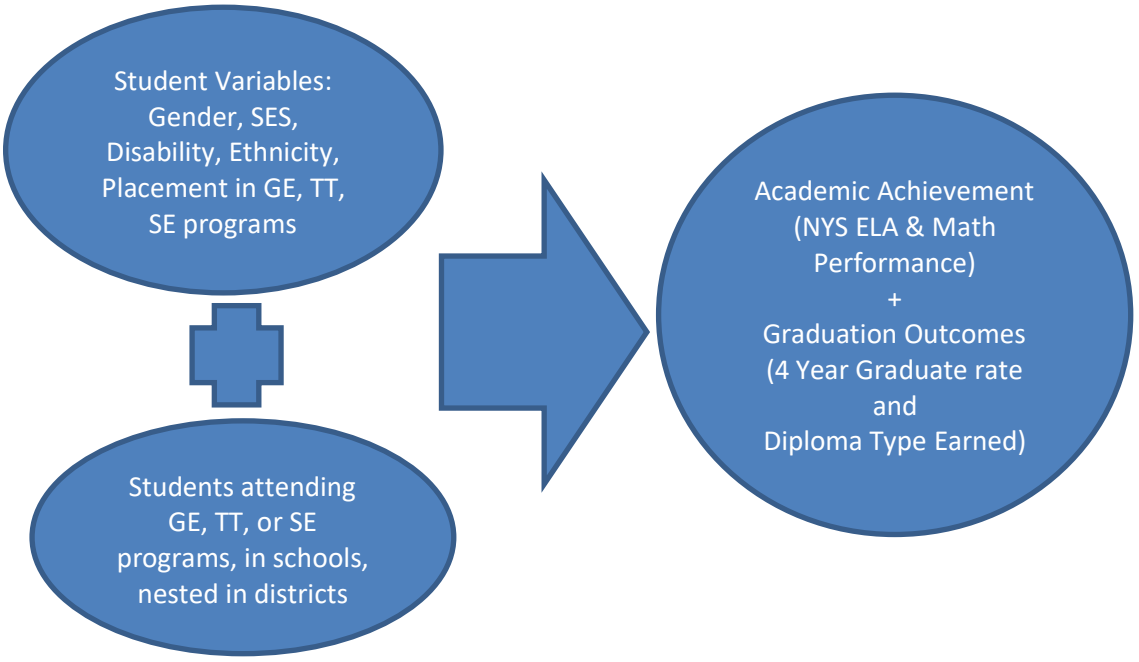


Figure 1.1. Input/Output framework

In the present time of academic accountability, school districts depend on certain instruments, typically standardized assessments, to evaluate student levels of academic performance (Hamilton, 2003). NYS introduced standardized tests in Grades 3-8 that were intended to provide benchmarks for evaluating academic performance in the areas of ELA and math. A narrow body of research has been conducted on EL students' ELA and math scores pertaining to the type of instructional program or classroom environment in which they were educated, such as a special education, inclusion classroom, or general education classroom. In addition, limited research exists on the long-term effects of specific program types on graduation outcomes.

Limitations and Delimitations

Limitations

There were limitations to this study, none of which were unfavorable to the main objectives of this study. First, this study was a secondary analysis of district-level data; therefore, limitations were intrinsic in the sample, selection of variables, and analysis. Some of the main limitations had to do with student background, such as the student-level background characteristics discussed earlier, parent support, family educational background, and future aspirations. All of these were limitations to this study because it was not always clear to determine whether these factors affected academic achievement more than the school's instructional program students were assigned to during their academic career.

In addition, this study was conducted using the performance data from one large school district with 34 smaller community school districts in NYC. Each community

school district (located across the five boroughs of Brooklyn, the Bronx, Queens, Manhattan, and Staten Island) has its own individual and unique characteristics of economy, ethnicity, and so on. Therefore, the results of this study may in some cases and may not in other cases be generalized across all school districts in various parts of the United States and for all students with the special needs categories that were studied.

In terms of the specific programs studied, the make-up of individual classes within the programs also presented a limitation. Three specific programs were studied. Although accounting for certain variables that could impact individual classes, other variables, such as the varying ability levels of the students or the number of specific students in a specific class, within the limits of the law, could not be controlled. Further, the interpretation of "program effectiveness" was limited to outcomes in ELA and mathematics. Therefore, it is possible that other important outcomes that matter for EL student development were not captured based on these outcomes.

The primary schooling part of the study also spanned 6 years. However, it is possible that students were not consistently enrolled in each of the programs throughout their schooling. That is, the program requirements for this study included that the student had to attend a specific program for at least 3 years. Therefore, the lack of continuity in placement of each of the instructional programs could have negatively affected the results of the current study.

Another significant implication that can be garnered from this study was the lack of available information related to the implementation of bilingual special education. For this study, the NYCDOE provided this researcher with information regarding the academic instructional programs in which students were enrolled. In addition, students

were identified as non ELs, ELs, or former ELs. However, though NYC offers several bilingual education programs, this information was not provided to the researcher. Therefore, it is possible that the specific type of linguistic program in which students were enrolled could have impacted their test scores.

Finally, with respect to the design of the study, it was not possible to develop an experimental design with randomized assignments for the treatment or control groups; therefore, causal/quasi-experimental research approaches were used. While non-experimental design methods are often used in education research, it is not as reliable as experimental research. Thus, an exploratory propensity score-matching procedure was also used in this study to provide a more balanced sampling technique and reduce the influence of selection bias. This is discussed in more detail in Appendix A.

Delimitations

This study has several delimitations. First, data analyzed for this study included only one school district consisting of 34 smaller communities within five boroughs. While these data may be generalizable for similar groups or populations of EL students, in similar school districts, they are not generalizable to all school districts, programs, and EL students.

The EL students investigated in this study have taken the same exams during the NCLB legislative time period. The data were collected and analyzed for the 2006-2016 school years, for one specific cohort. Specifically, 6 years' worth of data were collected from the NYS ELA and mathematics assessment for the 2011 cohort. In addition, on-time graduation status and type of diploma earned upon graduation were obtained for each student. Using these data, the interpretation of achievement for this study was based on

scores from standardized state exams, graduation status, and type of diploma earned. In addition, for the purposes of this study, these variables represented student achievement over a long period of time.

Finally, LMM analyses were conducted on variables to better isolate the relationship that placement in the respective instructional programs might have on student performance. Nonetheless, not all variables were accounted for. Factors such as socioeconomic status, gender, disability type, and ethnicity were included; however, other factors existed outside the range of this study. Consequently, the findings from this study may generalize to similar districts with comparable populations. A more comprehensive description of student-level demographics is provided in Chapter III of this study.

Definition of Terms

In examining the complex nature of cultural and ethnic backgrounds, language proficiency, as well as special education categories, it is important to establish common language and terminology to reduce ambiguity. For the purpose of this study, the following terms are defined to explain and bring consistency to the discussion as it relates to English Learners with a disability, the programs they are enrolled in, and their culture in the study. This section defines terms that were used throughout this study. Unless otherwise noted, definitions in this section were taken from the *Dictionary of Common Special Education Terms and Acronyms*.

Academic Achievement: Academic achievement is the level at which a student performs academically. For this study, the degree of proficiency is measured by the New

York State English Language Arts and Mathematics assessments on the aforementioned four-point scale.

Achievement Gap: This gap refers to inequalities based on race, ethnicity, and/or income in academic performance among groups of students (Reynolds, 2002). This gap is reflected in grades, standardized test scores, course selection, dropout rates, college completion rates, and other success measures. It is often used to describe the performance gaps between African American and Hispanic students, who may be at the lower end of the performance scale, and their White peers, which may also represent academic disparities between students from low-income families and higher-income families.

Educational Equity: The study and achievement of fairness in education.

Free and Reduced Lunch: A federal initiative that provides free or inexpensive lunches to children from low-income families. Students must demonstrate eligibility to participate, and then schools receive cash subsidies from the U.S. Department of Agriculture to pay for the food.

Emotional Impairment (EI): IDEA defines EI as a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree, which adversely affects educational performance:

- an inability to learn which cannot be explained by intellectual, sensory, or health factors;
- an inability to build or maintain satisfactory interpersonal relationships with peers and teachers;
- inappropriate types of behavior or feelings under normal circumstances;
- a general pervasive mood of unhappiness or depression; or

- a tendency to develop physical symptoms or fears associated with personal or school problems.

The term includes children who are schizophrenic, but does not include children who are socially maladjusted, unless it is determined that they are emotionally disturbed.

English Learners (ELs): Students enrolled in U.S. schools who speak a language other than English and have not yet mastered English. They are either immigrants or children born in the United States. Each state has a different way of ascertaining whether a child is an English language learner. Usually the students receive bilingual education or English-as-a-second-language services. EL refers to non-native English speakers who are learning English. Many educators prefer this term to other terms (e.g., limited English proficient or LEP) because it takes a strength-based approach and focuses on abilities of students from a language acquisition standpoint (*LD Online Glossary, 2017*).

English as a New Language (ENL): Formerly known as English as a second language (ESL); a research based-program comprised of (a) content area instruction in English with home language supports and appropriate scaffolds, and (b) an English language development component. ENL is delivered through a stand-alone model or integrated ENL, explained as follows:

- Stand-alone English as a New Language: An ENL delivery model in which students receive instruction to acquire the English language needed for success in core content courses. A student cannot receive stand-alone English as a new language in lieu of core content area instruction.
- Integrated English as a New Language: An ENL delivery model in which students receive core content area (i.e., English language arts, math, science,

or social studies) and English language development instruction from a dually certified teacher or two certified teachers (*English Language Learner Policy and Reference Guide*, 2018).

Free Appropriate Public Education (FAPE): A required component of IDEA, FAPE mandates that school districts provide access to students with disabilities in a general education environment while receiving special educational services. Furthermore, it requires that children with disabilities receive support free of charge, as is provided to non-disabled students (*LD Online Glossary*, 2017).

General Education Classroom: The general education classroom, also known as a regular education classroom, is a classroom where non-disabled students receive classroom instruction. This type of classroom is taught by a general education teacher. No disabled students are present in this setting.

Home Language Arts (HLA): Formerly known as Native Language Arts (NLA); a unit of study or its equivalent in language arts in the student's home language. Such units of study are aligned with the Common Core Learning Standards (*English Language Learner Policy and Reference Guide*, 2018).

Inclusion: Inclusion is defined as the placement of students with disabilities in general education classrooms. Inclusion involves bringing services to the disabled child within the general education classroom. In this study, disabled students in inclusive classrooms are classified as Learning Disabled (LD), Speech Impaired (SI), and/or Other Health Impaired (OHI), according to NYSED guidelines.

Individuals with Disabilities Education Act (IDEA): The Individuals with Disabilities Education Act (IDEA) is the nation's federal special education law that

ensures public schools serve the educational needs of students with disabilities (*LD Online Glossary*, 2017).

Individual Education Plan (IEP): A plan outlining special education and related services specifically designed to meet the unique educational needs of a student with a disability (*LD Online Glossary*, 2017). The IEP creates an opportunity for teachers, parents, school administrators, related services personnel, and students (when appropriate) to collaborate with the goal of improving educational results for children with disabilities. The IEP is the foundation of a quality education for each child with a disability.

Language Assessment Battery-Revised (LAB-R): Former assessment used to determine ELL status prior to implementation of the New York State Identification Test for English Language Learners (NYSITELL); the Language Assessment Battery-Revised (LAB-R) was discontinued by the NYSED on January 31, 2014 (*English Language Learner Policy and Reference Guide*, 2018).

Lau v. Nichols: A 1974 landmark decision, *Lau v. Nichols*, the U.S. Supreme Court established the right of English Language Learner (ELL) students to have "a meaningful opportunity to participate in the educational program." That same year, an agreement between the New York City Board of Education and ASPIRA of New York assured that ELL students would be provided Bilingual Education. As such, ELLs must be provided with equal access to all school programs and services offered to non-ELL students, including access to programs required for graduation (*English Language Learner Policy and Reference Guide*, 2018).

Least restrictive environment (LRE): A requirement, based on IDEA, that states that to the maximum extent possible, children with disabilities are to be educated in the same environment alongside children who are not disabled or with general education students (to the best extent possible). Removal of children with disabilities from the regular educational environment occurs only when the nature or severity of the disability of a child is concerning to the extent that education in regular classes with the use of supplementary aids and services cannot be achieved successfully (Nichols, Dowdy, & Nichols, 2010).

Learning disability (LD): A disorder that affects people's ability to either interpret what they see and hear or to connect information from different parts of the brain. It may also be referred to as a learning disorder or a learning difference. It involves one or more psychological processes in understanding or in using spoken or written language. It may manifest in imperfect abilities to listen, think, speak, read, write, and/or spell (*LD Online Glossary*, 2017).

New York State ELA Assessment: An assessment that students in New York State public schools take yearly from Grades 3-8 to determine mastery of the K-8 NYS Learning Standards. The test consists of a variety of question types, including multiple-choice and short-answer questions, based on reading passages. The assessment is measured using a scale scoring system, which is used to compare test results across grade levels (NYCDOE, 2009).

New York State Mathematics Assessment: An assessment that students in NYS public schools take yearly from Grades 3-8 to determine mastery of the K-8 State Standards. The test consists of a variety of question types. The assessment is measured

using a scaled score, which is used to compare test results across grade levels (NYCDOE, 2009).

Other Health Impairments (OHI): OHI means having limited strength, vitality, or alertness, including a heightened alertness to environmental stimuli, that subsequently results in limited alertness with respect to the educational environment—that is, secondary to chronic or acute health problems such as asthma, attention deficit disorder or attention deficit hyperactivity disorder, diabetes, epilepsy, heart conditions, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever, and sickle cell anemia, which can in turn adversely affect a child's educational performance.

Socioeconomic Status (SES): For the purpose of this study, socioeconomic status was identified by using free or reduced school lunch data. Students were categorized into one of three levels: (a) No Free Lunch, (b) Reduced Lunch, and (c) Free Lunch. A student who qualified for and received free or reduced school lunch was categorized as a student living in a low-income household.

Special Education Services: Special education is a continuum of specially designed instruction, including a combination of supports and services, intended to meet the unique needs of a child with a disability. These supports and services are documented in a student's Individualized Education Program (IEP) (*LD Online Glossary,* 2017).

Speech and Language Impairment (SI): The official term used in federal legislation to refer to difficulty in processing language (*LD Online Glossary*, 2017).

Student With an Educational Disability: "Children with disabilities" or "students with disabilities" comprise children or students who require special education because of an IDEA classification with one of the following: autism; communication disorders; deaf

blindness; emotional disturbances; hearing impairments, including deafness; intellectual disability; orthopedic impairments; other health impairments; specific learning disabilities; traumatic brain injuries; or visual impairments, including blindness.

Organization of the Dissertation

This dissertation consists of five chapters. Chapter I began with background on the topic of English Learners with a disability. It was followed by a statement of the problem, its purpose and significance, as well as research methodology, which included the research questions. This chapter concluded with a description of the theoretical and conceptual foundation of the study as well as definitions of terms. Chapter II next presents the theoretical framework and conceptual framework of the study, in addition to a past and current review of the literature and research on the topic. In Chapter III, the specific research questions of the study are presented, followed by a description of the overall research methodology and analyses used in the study. Chapter IV provides an analysis of the data and results. The dissertation concludes with Chapter V, which offers a discussion of the research findings and an exploration of theoretical and practical implications. In addition, Chapter V includes the limitations to the current study and recommendations for future research directions.

Chapter II

THE LITERATURE REVIEW

Introduction

The purpose of this study was to examine the influence of special education instructional programs designed to serve English Learners (ELs) within the NYC public school system. This chapter first presents a general overview of existing research on the population of ELs with disabilities. It is followed by the theoretical framework and conceptual framework for the study. The review of literature is then divided into the following sections: history of bilingual education; history of special education; history of bilingual special education; research related to the referral process for ELs with disabilities (including student-level variables for this study); and instruction and supports for ELs with disabilities in NYC schools. A summary of the main themes and findings within the reviewed literature is reported at the end of the chapter.

Background

As school populations throughout the nation continue to grow in size and diversity, New York State K-12 public schools lead the country—along with Texas, Florida, and California, and cities such as Chicago, Phoenix, and NYC—in increased enrollment and demographic change. Of the 1,141,232 K-12 NYC public school students,

as reported for 2016-2017, approximately 14.9% were identified as White, 26.5% as Black, 15.8% as Asian, and 40.4% as Hispanic/Latino, while the remaining 2.3% represented multiple other races (NYCDOE, 2017). A little over 41% (438,131) of the students enrolled in NYC public schools speak a language other than English at home, consisting of over 160 different languages. More notably, 159,162 or 14.4% of NYC students are classified as English learners (ELs). Furthermore, approximately 34,372 ELs are classified with a disability and receive some type of special education service (NYCDOE, 2014).

As can be seen, NYC demonstrates remarkable statistics in linguistic, ethnic, and racial diversity. Accordingly, the difficulty of designing appropriate instructional programs and settings for minority students has become interlaced with issues of culture, language, equity, and compliance. The components for an "appropriate educational setting" include appropriate instructional programs, intervention strategies, relevant assessment practices, teacher attitude, and cultural/ethnic awareness (Rodriguez, Prieto, & Rueda, 1984). Referral to special education is a common institutional response to academic failure. However, a long-standing issue for researchers and educators has been the part that inappropriate educational environments in the general education classroom have played in the overrepresentation of linguistically and ethnically diverse children in special education.

According to Sullivan (2011), ELs throughout the state of New York are more likely than native English-speaking peers to be placed in special education. At times, these particular students are classified with an educational disability of learning impairment or speech and language impairment, and are less likely to be placed in the

least restrictive environment (LRE). Furthermore, according to Ortiz (2001), students who are ELs and receive special education services are at a disadvantage because of the shortage of special educators who are trained to address both language and disability-related needs simultaneously.

Data published on the NYCDOE's website indicated that 42% of NYC students attending public school in Grades 3-8 did not achieve proficiency in English Language Arts (ELA) in the 32 school districts (Hoxby & Muraka, 2007). This indicated that they had not mastered the curriculum for Grades 3-8. Current statistics are even worse for students with disabilities. According to NAEP (2007a, 2007b), children and youth placed into special education reportedly consistently displayed below-basic levels of academic achievement.

With regard to EL students, indicators representing national origin, time in country, and generational statistics have also been found to be important sources of variation in student math and ELA performance at the elementary and secondary levels (Callahan, Wilkinson, & Muller, 2010; Reardon & Galindo, 2009). EL students tend to demonstrate lower academic success rates, lagging in student outcomes such as student learning levels and graduation rates. Furthermore, both ELs and students with disabilities have had among the highest retention and dropout rates of all youths (Duran, 2008; NYCDOE, 2010; Stillwell, Sable, & Plotts, 2011).

According to many researchers in the field of education, in order to understand the complexities of the educational situation in which the children in question are involved, we must look at special education instructional programs and bilingual education language programs. We must also look at bilingual special education programs, according

to Serpa (2011). In addition, we must look at the general expectations for the academic achievement of ELs in special education classrooms/programs in the United States.

On one side of the language instruction debate, some research has suggested that ELs benefit most from being immersed in English-only classrooms. This is because spending more time on task practicing English results in quicker English language development (Baker, 1998; Porter, 1990; Rossell & Baker, 1996). On the other side, some research has suggested that in order to learn another language, children require a fundamental literacy base in their first language, and that encouraging the continued development of children's first language will later transmit to the development of the new language because languages share common underlying skills (Cummins, 1979, 2000; Goldenberg, 1996).

In terms of special education instructional programs, the result has been a move towards increased inclusion in schools for the majority of students classified with a disability, rather than full-time special education classes, where students are not educated with typically developing peers. In many school districts, the co-teaching or collaborative team-teaching model has evolved into a viable, effective answer for school districts (Nichols et al., 2010). With test-based accountability now a part of the educational experience for all students, effectively applying various teaching models and investing in their impact on students are important (Murawski & Swanson, 2001). Tracking students' growth patterns in these programs is therefore vital, and longitudinal studies can help researchers analyze the changes of students' performance as an ongoing process of growth within and between students.

Although there is a sizable body of literature comparing the effectiveness of bilingual education to English immersion instruction among ELs, there are still many gaps in the literature. In a recent study, Valentino and Reardon (2014) found that within the school district studied, ELs attending dual immersion programs almost always outperformed their peers in transitional and developmental bilingual programs. In a prior study, Thomas and Collier (2002) found that in all districts, the students attending developmental bilingual programs always performed at least as well as and, in some districts, better than those in transitional bilingual programs and English only. Building on the prior research of Valentino and Reardon, instead of focusing on the linguistic instructional programs, this current study focused on the academic outcomes, through high school, of EL students classified with an educational disability, attending special education instructional programs, in a large NYC urban school district in the northeast part of the United States/

This focus was conducted by comparing the effectiveness of three specific special education academic programs for ELs and evaluating whether these programs were differentially effective for EL students of different ethnicities and type of disability. The programs were as follows: General Education with Related Services (RS) and/or Special Education Teacher Support Services (SETSS); Collaborative Team Teaching (TT); and Special Class in a Community School (SE) or Specialized School (SS). These programs are described in the Instruction and Support section of this chapter in more detail.

This study also examined the influence of other student-level background variables such as gender, socioeconomic status, ethnicity, and type of disability on the dependent variables. For this study, linear mixed methods attempted to isolate the

variable of placement in the special education programs. However, the examination of these other student-level variables was necessary because previous research has shown that these background variables can impact academic achievement (Hill et al., 2008). The specific ethnic groups discussed in this study were as follows and are further discussed in the variables subsection of this study: White, Hispanic, Black, and Asian. The specific disability groups discussed were as follows: Learning Disability, Speech Impairment, Emotional Impairment, and Other Health Impairment. Gender groups consisted of male or female. Socioeconomic status was determined by whether or not students received free lunch. Finally, results using an exploratory propensity score matching method coupled with the HLM was utilized. This approach is detailed in the Appendix A.

Theoretical Framework

Maxwell (2005) and Rockinson- Szapkiw (2013) both explained the theoretical framework as a mechanism for aligning literature review, research design, and its methodology. This research examined the theoretical beliefs behind IDEA, NCLB, and ESSA. According to IDEA, any students identified as having a disability and/or who are eligible for special education services must be provided the same educational services free of cost, and such provision of services must be appropriate to their educational need. This provision is termed *free appropriate public education* or FAPE. The IDEA also specified that these services must be provided in the least restrictive environment (LRE) possible. In line with Coleman and Howe's theories related to educational opportunity, in a typical school setting, this means students with disabilities are afforded an "equitable

education" in an environment with their non-disabled peers (NYCDOE Committee of Special Education Standard Operational Manual [CSE SOPM], 2009).

Despite the law's LRE mandate, a review of the literature on the subject since the inception of the IDEA in 1975 indicated that students with disabilities nationwide continue to be isolated from and exhibit lower achievement success rates than their non-disabled peers. This is the case of ELs with disability as well. This lag in student outcomes is often measured by student learning levels, graduation rates, dropout rates, and participation levels in postsecondary opportunities (equal educational outcomes).

Education reform, under NCLB and more recently ESSA, involves analyzing the educational system to determine students' achievement (educational outcomes), including the subgroup of students with disabilities. The NYC Board of Education has embraced these principles in its own reform initiatives. New York State in collaboration with New York City utilizes standardized test scores as an indication of academic achievement and graduation rate. These scores are incorporated into a school's yearly performance, which is an indicator to parents and educational administrators of how well the school and its students are responding to the present curriculum. This becomes an important factor to schools with regard to their subpopulations, including ELs and students with disabilities, to ensure that they are achieving in their educational environment (finding success in link or channel of equal opportunities).

Based on these beliefs, NYC schools provide a basis for Individual Education Plan (IEP) Teams to develop service recommendations (educational staff demonstrating comprehension) and inform parents of options available for students with disabilities (providing the parents with a real rather than bare opportunity by educating the parents

regarding their rights). These services are also reportedly provided, to the greatest extent possible, in the LRE (to ensure inclusion of disabled students within the general education setting), within the neighborhood/community district school. In addition, the NYC Board of Education supports the development of a unified, whole school approach to service delivery. Services provided in general education with special education supplementary aids and services should reportedly be the first option considered for any disabled student determined to require special education services.

For those students who are unlikely to succeed even with the help of well-designed, carefully implemented, and rigorously assessed general education interventions, special education services can often be delivered in the general education classroom (i.e., RS or SETSS).

As reflected in Figure 2, where services delivered in the general education classroom are not likely to result in student success, a continuum of alternative options are available as follows: in the form of special classes (either full- or part-time) in community school district schools and high schools; special classes full-time in specialized school settings; state-supported/operated and special education-approved non-public schools (SED) and services provided at home or in a hospital. In each of the settings, and according to their IEPs, all students are eligible for bilingual services. Students are also eligible for related services and other services such as toilet training, adapted physical education, travel training, and extended school year (12-month instruction).

The primary variables to be identified in this study included three specific educational environments/programs for EL students with disabilities and their New York State ELA as well as math standard scores from Grades 3-8. In addition, long-term outcome data such as graduate rate and type of diploma earned data were identified based on the program placement of the students. These specific variables are described in more depth in the referral and instructional support section of this chapter as well as methodology chapter of this study.

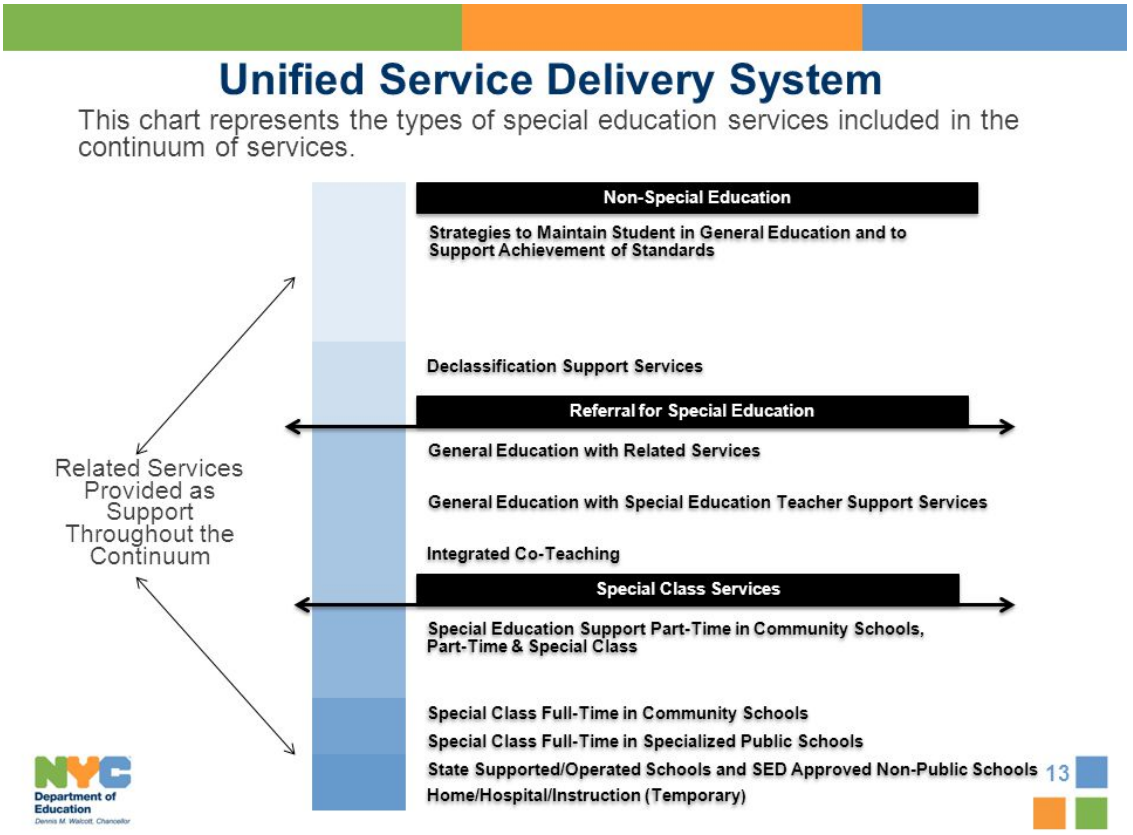


Figure 2.1. Unified service delivery system

Conceptual Framework

A conceptual framework is defined as the way ideas are organized to achieve a research project's purpose (Rockinson-Szapkiw, 2013). A conceptual framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought (Shields & Tajalli, 2006). The review of the literature for this study was organized by the following areas: history of ELs; history of special education; history of bilingual education, referral and placement of ELs with disabilities; and instruction and supports for ELs with disabilities. These different areas together represent the intersection between EL students and special education.

History of Bilingual Education

Before the 1900s, there were very few laws ensuring that English Learners would receive an appropriate education, as many only learned enough English to get them through their schooling. One of the first laws passed in recent history was Title VI of the Civil Rights Act of 1964, which prohibited discrimination on the basis of race, color, or national origin in any federally assisted program. A second act that was important to the schooling of ELs was Title VII of the Elementary and Secondary Education Act (ESEA) of 1968. This act established federal policy for bilingual education for language minority students who were economically disadvantaged, recognized the challenges that students who do not speak English encountered, and allocated funding for programs for this population. Part of the ESEA of 1968 was the Bilingual Education Act of 1968, which was passed to promote research and experimentation of specific, educational programs for students who do not natively speak English (Nieto, 2009).

In the early 1990s, right before the beginning of the Clinton administration, a bilingual advocacy group called the Stanford Working Group devised a set of recommendations designed to ensure that bilingual education was included with the overall school reform agenda. Many of the group's recommendations were later adopted during the Clinton administration. The recommendations encouraged bilingual education, specifically developmental bilingual programs; defined states' role in ensuring adequate bilingual education programs; and mandated districts to identify and provide services for ELs and involve their parents in the decision-making process (Nieto, 2009).

Currently, several programs in the United States are offered for English Learners which include, but are not limited to, English as a Second Language (ESL), Transitional Bilingual Education (TBE), Developmental Bilingual Education (DBE), and Dual Language program. The most common form of the ESL program provided is called ESL pull-out, in which EL students spend the majority of the school day in monolingual English classes and participate in small group instruction in English by a teacher using ESL methodologies and providing native language support for 30-45 minutes daily. The Transitional Bilingual Education program provides EL students with native language instruction and gradually decreases the amount of native language exposure, while increasing English instruction as students become more proficient in English. The Developmental Bilingual Education program is similar to TBE, except the goal is to develop EL students' competency in English while maintaining native language proficiency. The Dual Language program generally includes an even number of native English speakers and native speakers of another language, and academic instruction is provided in both languages for equal amounts of time (Crawford, 2004).

Bilingual education in New York City. New York City, the setting for this study, has witnessed a proliferation of ESL/bilingual programs over the past two decades. As the demographics of the city change, so do programs intended to serve the new populations. Hence, in NYC in general, and particularly in Brooklyn, the Bronx, and Queens, many schools have opened to address the needs of an increasing EL population. Currently, around 100 schools citywide offer some form of bilingual or ESL program, and the languages include French, English, Spanish, Chinese, Haitian Creole, and Korean (NYCDOE, 2014). Keeping in line with the educational equity theme of Howe and Coleman, the message on the Department of Education ELL page states that the DOE is dedicated to serving students with limited English language skills and their parents through professional development for teachers, the publication of better educational materials, and an environment that promotes academic achievement and language development with cross-cultural understanding. To accomplish its stated goals, the NYCDOE has created many curricula targeted specifically to ELs. Currently, bilingual education programs offered in NYC include ESL, TBE, and ESL, as described in the previous section (*English Language Learner Policy and Reference Guide*, 2018).

History of Special Education

One of the first laws to be enacted for Special Education was the Education for All Handicapped Children Act (Public Law 94-142) that was passed in 1975. Although most states had some form of public education around 1920, there were few opportunities for students with disabilities in those schools. Even when the federal government began providing funds for public education with the National Defense of Education Act in 1958, students with disabilities continued to be deprived of an adequate education. In fact, the

only students with disabilities receiving anything close to an "appropriate" education were those students who were deaf and blind, and these students were educated in state-run facilities away from home (USDOE, 2010).

According to the USDOE (2007), only 20% of all students with disabilities were educated in U.S. schools in 1970. However, the *Brown v. Board of Education* decision, which mandated that schools desegregate across the country, provided a spark for change. Many leaders who advocated for desegregation of students with disabilities used the case as grounds that students with disabilities should not be excluded from public schools (La Morte, 2008). As the movement to improve these conditions increased, the federal government began to implement changes. One of the first laws relevant to special education was the Elementary and Secondary Education Act (ESEA), which focused on equal access to education but targeted underprivileged and economically disadvantaged students over students with disabilities. The law evolved over time, replaced by Title VI, which was in turn repealed and replaced by the Education of the Handicapped Act. The Education of the Handicapped Act created the Bureau of the Education of the Handicapped (BEH) and the National Advisory Council, which is now called the National Council on Disability (Parents United Together, n.d.). While these laws did not create the federal, state, and local mandates for students with disabilities that exist today, the legislation did bring attention to the needs of students with disabilities and provided a starting point for further legislation and change (La Morte, 2008).

Two major court cases, *Pennsylvania Association for Retarded Children (PARC) v. Commonwealth of Pennsylvania* (1972) and *Mills v. Board of Education of the District of Columbia* (1972), provided turning points for students with disabilities and a

foundation for the Individuals with Disabilities Education Act (IDEA), which remains the cornerstone of special education legislation (Weber, 2009). In both cases, parents of students who were denied access to public education sued their school districts, claiming the students should not be excluded. In each case, the court ruled in favor of the students, claiming that students be provided with a free public education. Specifically in PARC, the court went further in laying the groundwork for establishing the LRE (NYSED, 2009). Both cases paved the way for the inclusion of students with disabilities into mainstream classrooms.

These two cases began to eliminate the exclusion of students with disabilities in classrooms and began to mandate adequate services for those students. These cases provided a foundation for the IDEA (Weber, 2009). The cases also created a framework on which inclusion of students with disabilities in mainstreamed classrooms would be based.

Specifically, IDEA was enacted to improve education for children with disabilities. The Act had four major purposes. One purpose was to ensure that every handicapped child receives a free appropriate public education that emphasizes special education and related services designed to meet his or her unique needs. A second purpose was to assure that the rights of children with disabilities and their parents or guardians are protected. The third purpose was to assist states and localities to provide for the education of all children with special needs. Finally, the law was enacted to assess and assure the effectiveness of efforts to educate children with special needs (Yell & Rodgers, 1998).

Since 1975, the law has been revised many times. Each reauthorization has brought changes to the program. In 1997, it was reauthorized and called the Individuals with Disabilities Education Act (IDEA) of 1997. The purpose of the reauthorization in 1997 was to improve and increase the educational achievement of students with disabilities. IDEA was again reauthorized in 2004, and its main focus then was to increase the academic achievement of students in special education, to increase accountability for results, and to streamline the special education process (Weber, 2009).

IDEA and NCLB. In an effort to address public concern about the state of education, the No Child Left Behind Act of 2001 (NCLB) was a U.S. Act of Congress, signed in 2002 by President George W. Bush, that reauthorized ESSA. It included Title I requirements pertaining to disadvantaged students. It also reinforced standards-based education reform founded on the principle that establishing high standards and measurable goals could improve individual student outcomes in education. The Act required states to develop assessments in basic skills. To receive federal school funding, states had to give these assessments to all students at select grade levels (Price, 2010).

The NCLB Act did not assert a national achievement standard, but required each state to develop its own standards. NCLB expanded the federal role in public education through further emphasis on annual testing, annual academic progress, report cards, and teacher qualifications as well as significant changes in funding. Specifically, Congress believed that schools also had to improve instruction for special education students. As a result, NCLB determined that special education students would be included in the testing given by the states each year. The results of students with disabilities on these tests would be part of the score used to determine the effectiveness of the school in meeting adequate

yearly progress (AYP), as determined by data from the assessments (Katsiyannas & Shiner, 2006). As a result, there is now increased emphasis on the achievement of students with disabilities on state assessments.

The Every Student Succeeds Act (ESSA). Though in 2002 the NCLB bill passed in the Congress with bipartisan support, by 2015 a bipartisan Congress passed the ESSA to replace NCLB due to criticism on all sides. The Every Student Succeeds Act (ESSA) is the most recent version of the Elementary and Secondary Education Act (ESEA)—the nation's major federal law related to public education in Grades Pre-Kindergarten through high school. Passed in December 2015 by President Obama (or signed into law), ESSA made several changes to the Individuals with Disabilities Education Act (IDEA). These amendments to IDEA and other technical changes were incorporated into federal regulations published on June 30, 2017 (McGuinn, 2016).

Specifically, ESSA reduces the federal role in education accountability decisions by eliminating many prescriptive requirements set forth by the controversial NCLB Act and allowing states greater leeway in designing their own accountability systems. ESSA requires that states establish student performance goals, hold schools accountable for student achievement, and include a broader measure of student performance in their accountability systems beyond test scores. It also eliminates NCLB's specific list of corrective actions and required school improvement strategies. In its place, ESSA allows districts to design and implement their own turnaround plans for low-performing schools (Young, Winn, & Reedy, 2017).

While ESSA includes many of the same requirements as NCLB, there is now more flexibility in how those requirements are met—particularly when it comes to state

and federal roles. The Education Commission of the States (ECS) was created by states in 1965 to track policy, translate research, provide unbiased advice, and create opportunities for state education policymakers to learn from each other. Under NCLB, the USDOE assumed a greater role in public education by mandating certain requirements, including how assessments were handled and how teachers and schools were evaluated. With ESSA, the USDOE has taken steps to allow states to take the lead role in determining how federal requirements will be met, including how failing schools should be handled (McGuinn, 2016).

Nonetheless, because ESSA is fairly new, the long-term impact on students and academic performance will not be known, so it may be a while before one knows how ESSA impacts students and the schools they attend. In addition, NYC does not have a complete data set; therefore, the focus of this study was on NCLB.

Bilingual Special Education

Bilingual special education, as a distinct field of study, has been formally in existence since 1973 (Baca & Valenzuela, 1994). Due to the increasing number of minority students during the 1960s, particularly Hispanics, states were mandated to provide services for students with disabilities and limited English proficiency (LEP). Since the 1980s, bilingual special education programs, have been initiated in states in which the population of minorities has increased significantly (Ortiz & Ramirez, 1988). As a result, there has been a push to combine both bilingual education and special education to meet the needs of EL students with disabilities across the nation (Maldonado, 1994).

According to Serpa (2011), in order to provide this population with an equitable education, educators need to implement practices that are governed by the simultaneous use of EL laws and special education laws. One of the laws that was specific to ELs and special education was the Civil Rights Act of 1964, which required that school districts take steps to rectify the child's language weaknesses. It required that school districts avoid labeling students as mentally retarded based on criteria that actually reflected their English language proficiency. In addition, the Act also required that school districts notify ethnic minority parents of school activities. This law impacted all students, including ELs in special education, as the law prevented discrimination against students on the basis of their national origin and also prevented students from being excluded from participating in education because they did not understand, speak, or read English (Serpa, 2011). The Civil Rights Act also required that schools communicate with parents in a language that they understood. The law specifically delineated that districts were to avoid any language-based placement that permanently put ELs in an ability group. Furthermore, it required that students who did not speak English were to be taught the language and required districts to provide alternative language programs that were necessary to ensure that ELs had meaningful access to the school's programs (Serpa, 2011).

The Individuals with Disabilities Act (1975), which was amended in 1997, went on to state that ELs could not be eligible for special education services if it was determined that students' learning problems were the result of environmental, cultural, or economic disadvantage. Three prominent legal cases pertaining to EL students and special education included *Diana v. State Board of Education* (1970), *Guadalupe v. Tempe* (1972), and *Lau v. Nichols* (1974), which paved the way for how EL students

should be assessed and identified for special education. These legal cases concluded that the assessment of EL students must be conducted in their native languages. During students' meetings to determine whether or not they qualify for services, language had to be considered. Their language needs had to be addressed when the team developed, reviewed, and revised their IEP. Not discussing this important factor could lead IEP teams to place students in programs which did not meet their individual needs (Maldonado, 1994).

Since the time of these legal cases, the field of special education has changed slightly and, because of this, the need to change how bilingual special education serves children with learning disabilities has also changed. Bilingual special education students are both an overrepresented and underrepresented segment of the ranks of special education students (Baca & Valenzuela, 1994). The combination of two relatively recent pieces of legislation, NCLB and IDEA 2004, have moved more students with disabilities into the general education classroom for a variety of reasons (Katsiyannas & Shiner, 2006). The ESSA continues to do the same. These laws have been enacted to protect the rights of all students, including EL students with disabilities. In addition, the primary goal is to improve student achievement by holding schools accountable for results. However, even with the current laws, there are still students who are either overrepresented or underrepresented in special education (Klingner & Harry, 2006).

IDEA and inclusion. Integration is an expression that replaced mainstreaming in the early 1980s. Much attention was placed on the fact that students with severe disabilities were grouped according to their educational environments such as special schools, development centers, and institutions away from their non-disabled peers. As a

policy reform effort, integration dominated much of the research and teaching literature of special education for most of the 1980s (Halvorsen & Sailor, 1990; Sailor, 2002). The primary objective of the integration movement was to educate students with severe disabilities in proximity to their general education counterparts, in order to provide students with disabilities the opportunity to interact with non-disabled students. The placement of students with disabilities was generally in special classrooms located within public school buildings. As a result of integrated education, students with disabilities would interact with their general education counterparts during lunch, recess, and special occasions (Sailor, 1991).

The term *inclusion* emerged in 1990, and specifically meant placing students with disabilities of all ranges and types into general education classrooms with appropriate services and supports that would provide equal access to education for the disabled and non-disabled (Filler, 1996). Inclusion efforts sought full membership in the school community and participation with peers at all levels of education. This was far different than the occasional mixing that integration provided. Inclusion was intended to provide students with disabilities with the same academic gains and achievements as their non-disabled peers (Lipsky & Gartner, 1997).

Bilingual special education in New York City. Currently, bilingual education programs offered in NYC include ESL, TBE, and ESL, as described in the previous section. In addition, the NYCDOE offers several specialized community school programs, which are not currently expected to exist in every community school. These programs include Bilingual Special Education, which is a special class for students who

are recommended to receive services in a bilingual classroom (*English Language Learner Policy and Reference Guide*, 2018).

Research Related to Referral Patterns for ELs With Disabilities

The overrepresentation of culturally and linguistically diverse children in special education and the quality of their educational experiences have been considered as among the most noteworthy concerns faced by the U.S. public school system in the past 30 years. The IDEA entitles all individuals with disabilities to a free appropriate public education (FAPE) and mandates the nondiscriminatory assessment, identification, and placement of children with disabilities. Children are not to be identified as disabled because of poor achievement due to environmental "disadvantage" or racial, linguistic, or ethnic difference. This is made clear by the recommended evaluation procedures and the definitions of disability conditions in IDEA. However, some ethnic groups continue to be overrepresented as disabled, particularly with intellectual impairments and emotional impairments, nationwide. State and local representation rates vary widely, but in many cases, show even more marked patterns of overrepresentation (Coutinho & Oswald, 2004).

A majority of the research that has been conducted on ELs with disabilities has focused on the referral rates and referral process for ELs who are suspected of having a disability. The fundamental purpose of these studies was to promote and ensure educational equity for a susceptible population of learners. In particular, research and school communities are concerned with the disproportionate representation of ELs in special education. According to De Valenzuela, Copeland, and Qi (2006), disproportionality in representation can take two forms: under- and overrepresentation.

Both are determined in comparison to the general student population, but in underrepresentation there is a lower number of a particular group of students in special education, while in overrepresentation there is a higher number of a particular group receiving special education services.

The debate over overrepresentation in special education. In a 2002 National Research Council study, Donovan and Cross reviewed the literature and data on differences in special education participation by disability and racial/ethnic groups. They further cautioned against using unadjusted aggregate group-level identification rates to guide public policy. They crystallized the challenge of interpreting these differences by explaining that no database currently exist where the number identified is in proportion to those whose achievement or behavior indicates a need for special supports (Donovan & Cross, 2002).

Differences in aggregation, covariates, and samples generate different answers to the question of whether Black students are over- or under-identified for special education. The most credible studies have allowed researchers to control for a rich set of student-level characteristics, rather than using data aggregated to the district level, and firmly establish that Blacks are disproportionately underrepresented.

In 2010, Hibel, Farkas, and Morgan used the Early Childhood Longitudinal Study—Kindergarten (ECLS-K) cohort (1998) and its follow-up waves to come closer to the ideal scenario described by Donovan and Cross. While individual-level models controlling only for race and gender showed Blacks more likely to be identified, adding a family socioeconomic status variable eliminated the effect of race for Blacks, while Hispanics and Asians were significantly less likely to be in special education. Adding a

student test score made Blacks less likely to be identified; Hispanics and Asians remained less likely to be identified as well.

A follow-up study found this result applied across the five disability classifications studied, notably including emotional disturbance and intellectual disability, stigmatizing categories in which Black boys are overrepresented in the aggregate, unadjusted data. While some have questioned the generalizability of the ECLS-K results due to sampling, the qualitative result has been replicated using the National Assessment of Educational Progress (NAEP; the 2018 Morgan et al. study), the Education Longitudinal Study of 2002, and the ECLS-Birth Cohort. These national patterns do not preclude local heterogeneity. Sullivan (2011) studied one Midwestern urban school district and found that while socioeconomic controls attenuate the impact of race, Black students remained more likely than others to be identified for special education; the researcher did not include student achievement as a covariate.

For those who are linguistic minorities, disproportional representation has occurred yet with some distinct patterns of representations, according to grade level and disability category. For instance, in recent years, researchers have found disproportional representation of ELs in special education by grade level. For example, Samson and Lesaux (2009) used a national data set representing over 20,000 students to investigate disproportionality of ELs in special education, finding that ELs were underrepresented in kindergarten and first grade, but were contrastingly overrepresented in special education in third grade across all disability categories. These findings suggest that there is a pattern of waiting to refer ELs to special education until they have had sufficient time to progress academically. This was corroborated by Ortiz et al. (2011), who found that ELs suspected

of having a learning disability (LD) were mostly referred in second grade and then third grade. This suggests a shift in educators' expectations of ELs' language proficiency; that is, educators surmise that by second and third grade, ELs' poor academic performance is attributed to the presence of a disability, not English proficiency.

Similarly, Artiles, Rueda, Salazar, and Higareda (2002) found that in urban Californian schools, patterns of overrepresentation emerged according to grade level, as ELs were overrepresented in the secondary level in the disability categories of intellectual disability and LD. However, ELs were underrepresented in secondary grades in the disability category of speech or language impairment (SLI), suggesting that educators may assume that, for example, when a student pronounces a particular phoneme differently in English, this is a manifestation of crosslinguistic transfer, not an SLI. Together, Samson and Lesaux (2009) and Artiles et al. (2005) indicated that age may be a factor influencing the proportionality of ELs' representation in special education. These studies corroborated the findings from Hibel and Jasper's (2012) recent study; educators delay referring ELs for special education services, possibly for ELs to develop further in their second language proficiency.

Research related to impact of student-level variables for this study. Not only can grade level play an integral role in special education representation for ELs, but also, as delineated in Artiles et al. (2002), patterns in disproportional representation can emerge according to learner and family background factors such as ethnicity type, disability category, gender, and SES. The examination of these other student-level variables is also necessary because these variables have been shown in previous research to impact on academic achievement, specifically student achievement scores (Hill et al.,

2008). The rest of this section reviews the background/demographic characteristics that can have an impact on academic achievement.

The specific ethnic groups discussed in this study are as follows and are further discussed in the variables section of this study: White, Hispanic, Black, and Asian. The specific disability groups are further discussed in the variables subsection of this study and are as follows: Learning Disability, Speech Impairment, Emotional Impairment, and Other Health Impairment.

Ethnicity. Over the last 20 years, student ethnicity has been identified as an influencing factor for student success in the classroom (Miller-Cotto & Byrnes, 2016). According to the NYCDOE website, in 2013, schools with the most English learners dropped by roughly 70% in both reading and math state assessments. Black and Latino students suffered a 56% decrease in reading scores and more than a 60% decrease in math scores from 2012 to 2013. Although Black and Hispanic students posted better scores on the 2014 exams compared with 2013, the achievement gap still worsened since White and Asian kids saw bigger increases. Citywide, 18.5% of Black students and 23.2% of Hispanic students were proficient on state math exams in 2014, compared with an overall proficiency rate of 34.2%. Reading scores showed a similar gap.

Disability. Currently, under IDEA, there are 14 disability categories: autism, deaf-blindness, deafness, developmental delay, emotional disturbance, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, other health impairment, specific learning disability, speech or language impairment, traumatic brain injury, and visual impairment including blindness (National Dissemination Center for Children with Disabilities, 2012a). Research has indicated that some disability categories

exhibit evidence of EL disproportionality. For example, De Valenzuela et al. (2006) in a study of one southwestern school district found that ELs were overrepresented in special education in the following disability categories: emotional disturbance, intellectual disability, LD, and SLI. However, they were underrepresented in the developmental disability category and proportionally presented in the category of OHI.

In terms of achievement, in another study, according to the SEELS reports, there is great diversity pertaining to the achievement levels of students with disabilities. The data indicated that it is possible to find children with disabilities who are scoring right near the top—above the 80th percentile—and you'll find some in the middle and then a lot more kids in the lowest quartile. Therefore, it's heavily weighted toward the low end but there's quite a bit of diversity. Although students with disabilities, as a group, tend to achieve in the lower half of the distribution of achievement, individuals with disabilities can be found across the full range of academic performance (Olson, 2004).

For example, students with emotional impairments or visual or orthopedic impairments are between 1 and 2.4 years closer to grade level than students with learning disabilities. Students with other health impairments and autism also are closer to grade level in reading, compared to their peers with learning disabilities but by less than one grade level. There are fewer disability-related differences with respect to mathematics than to reading performance. Only students with hearing or visual impairments outperform students with learning disabilities. Students with visual or hearing impairments are 1.5 and .4 years (respectively) closer to grade level in mathematics than students with learning disabilities, when other factors are controlled for. With the

exception of students with mental retardation, the performance of most of the other groups is similar to that of students with learning disabilities (USDOE, 2003).

Socioeconomic status. Socioeconomic status also has a huge impact on academic achievement (Potter, 2013). Research on the subject goes back to the Coleman Report, which was released during the Civil Rights Era. In that report, research indicated that socioeconomic status was the strongest predictor of academic achievement in students (Coleman et al., 1966).

Gender. Gender is another student variable frequently studied when evaluating variables related to student achievement. Research has shown mixed results in the academic achievement performance between boys and girls (Cheema & Galluzzo, 2013). For example, most national studies found that, on average, males outperformed females on math tests and females outperformed males on reading or (ELA) tests in the United States (Chatterji, 2006; Cimpian, Lubienski, Timmer, Makowski, & Miller, 2016; Fryer & Levitt, 2010; Husain & Millimet, 2009; Lee, Moon, & Hegar, 2011; Penner & Paret, 2008; Robinson & Lubienski, 2011; Sohn, 2012). These gender achievement gaps vary among states (Hyde, Lindberg, Linn, Ellis, & Williams, 2008; Pope & Sydnor, 2010), but there is little systematic research on variation in the gaps at a smaller geographic scale. Recent studies on the relationship between socioeconomic status and gender achievement, however, have provided evidence suggesting the gender achievement gaps may differ substantially among local communities.

In a recent study (the first systematic study of gender achievement gaps in U.S. school districts), Reardon, Fahle, Kalogrides, Podolsky, and Zárate (2018) estimated male-female test score gaps in math and ELA for nearly 10,000 school districts in the

United States. State accountability test data from Grade 3-8 students in the 2008-09 through 2014-15 school years were used. Results showed that the average school district in the sample had no gender achievement gap in math, but a gap of roughly 0.23 standard deviations in ELA that favored girls. Both math and ELA gender achievement gaps varied among school districts and were positively correlated—some districts had more male-favoring gaps and some more female-favoring gaps. Reardon et al. found that math gaps tended to favor males more in socioeconomically advantaged school districts and in districts with larger gender disparities in adult socioeconomic status. These two variables explained about one fifth of the variation in the math gaps. However, they found little or no association between the ELA gender gap and either socioeconomic variable (Reardon et al., 2018).

The following subsections discuss the program placement process of ELs as well as the instruction and support options available to ELs in NYC schools. First, an overview describing how the laws of special education and EL students intersect is given. Then, the Program Placement Process of ELs subsection discusses the process for placing EL students into special education. Finally, the Instruction and Supports section focuses in more detail on the program options available to ELs with disabilities.

Intersection of Special Education and EL Students Overview

The initial enactment of PL 94-142 was intended to deal with issues regarding access to programs for students in special education. The current special education focus is on the quality of the programs for EL students with disabilities and whether current programs are adequate for EL students with disabilities. Hence, for the purpose of this

research, it is important to understand how the laws of special education and EL students intersect and affect decision making within schools.

Special education laws were initially enacted to handle issues regarding student access to programs in special education (equality of education). Many students were not provided with the programs necessary for them to continue to progress academically. Special education laws have helped to ensure that students receive a free and appropriate public education (FAPE) and are placed in appropriate programs. Opportunities for students to receive a scope of services exist; however, lack of communication with parents and students can make this a bare opportunity if they are now aware of what services are available.

For the purposes of this study, in the NYC school district, policies are in place on how to access EL students for special education. Prior to being referred for an IEP, an EL student must have participated in the English Language Learner Identification Process before it is determined that a Special Education referral is necessary. Having starting policies such as this in place will help to ensure that EL students are not overrepresented or underrepresented in special education.

Program placement process for ELs in NYC. In New York State, all newly enrolled students and students re-enrolling after 2 years are required to complete a Home Language Questionnaire (HLQ). The HLQ must be conducted at the time of enrollment. Through this survey, along with an informal interview, a qualified teacher or other professional staff member will get to know what languages are used in the home. If the survey and the interview indicate that a language other than English is used in the home, the student must take an English language proficiency test called the New York State

Identification Test for English Language Learners (NYSITELL). The NYSITELL results are then used to assess the student's English language level (Entering, Emerging, Transitioning, Expanding, and Commanding). If your child scores at Entering (Beginning), Emerging (Low Intermediate), Transitioning (Intermediate), or Expanding (Advanced), he or she is identified as an ELL. ELLs are entitled to receive Bilingual Education (BE) or English as a New Language (ENL) services. If a student scores at the Commanding (Proficient) level, he or she is not identified as an ELL. These results also guide the school in programming the minimum number of minutes of English as a New Language (ENL) instruction per week for the student (*English Language Learner Policy and Reference Guide*, 2018).

For a student initially referred for a special education evaluation who does not have a Home Language Identification Survey (HLIS) (i.e., a student who has not attended a NYC public school), the school social worker on the IEP team must administer an HLIS at the social history meeting. Based on the results of the HLIS, a determination is made to determine whether the student is eligible to take the NYSITELL. If the student is determined to be an ELL and his/her home language is Spanish, a Spanish LAB will be administered in addition.

For students who are identified as non-ELLs, assessments are generally conducted in English. To the extent a non-ELL student demonstrates exposure to a language other than English, the impact of which may suggest the need for a bilingual assessment, the language of the assessment(s) must be determined by the IEP team. The IEP team makes this determination on the basis of an individual inquiry. The IEP team may determine that one or several assessments are more appropriately conducted bilingually in order to

determine more accurately the nature and extent of the student's needs and whether they are related to English language acquisition (*English Language Learner Policy and Reference Guide*, 2018).

Instructional programs and supports for ELs in NYC. The number of English Learners in public schools in the United States is approximately 5.3 million (National Clearing House for English Language Acquisition, 2011). There is also a high concentration of EL students enrolled in NYC public schools. According to the NYCDOE Office of English Language Learners, 159,162 students were designated as ELL in 2012, comprising about 14% of the city's school student population; 53% of ELLs were in elementary school (K-5), 19% were in middle school, and 28% were in high school. Spanish is the home language for a majority (64%) of all current ELs in NYC public schools (NYCDOE, 2013), with other common languages such as Chinese (14%), Bengali (4%), Arabic (3%), Haitian Creole (3%), Russian (2%), Urdu (2%), and French (1%).

English Learners create a unique challenge for educators to ensure that students gain access to the core curriculum in schools and acquire academic knowledge as well as English language skills. As mentioned, data from the Nation's Report Card (USDOE National Center for Education Statistics, 2011) showed that EL students lagged behind their English-proficient peers on standardized tests of reading and mathematics. ELs are also more likely than any other group of students to drop out of high school. According to the NYCDOE website, current statistics are even worse for ELs with disabilities.

Historically, bilingual education has been controversial. It is documented that from the colonial era to the present, bilingual education has been a greatly disputed topic,

with the United States going through periods of high and low tolerance of bilingual education programs. Two major opposing views on bilingual education have traditionally centered on the question of whether ELLs benefit more from maximizing exposure to English or from the development of their native language skills as a means to promote English proficiency.

Evaluating the best method for educating ELLs, as well as more broadly the effectiveness of bilingual education, is a critical focus as the United States continues to become more diverse. As discussed, several programs are offered in the United States for ELLs which include: English as a Second Language (ESL), Transitional Bilingual Education (TBE), and Dual Language program. Of all current ELs in NYC, the majority, just over 120,000 (77%), are in English immersion programs with ESL services (now known as English as a New Learner [ENL]); 27,881 (19%) are in TBE programs; and 6,125 (4%) are in Dual Language programs (NYCDOE, 2013).

As discussed previously, although there is a sizeable body of literature comparing the effectiveness of bilingual education to English immersion instruction among ELs, the literature still has many gaps. Building on the research of Valentino and Reardon described in the introduction section, instead of focusing on linguistic instructional programs, this current study focused on the academic outcomes, through high school, of EL students classified with an educational disability who are attending special education instructional programs, in NYC, a large urban school district in the northeast part of the United States. This was be done by comparing the effectiveness of special education academic programs for ELs and by evaluating whether these programs were differentially effective for EL students of different ethnicities and type of disability. The NYCDOE

continuum includes a list of special education services and programs that serve students with a variety of cognitive and social-emotional abilities, skills, and needs. This list ranges from services and instructional supports designed to help a student remain in general education classes (less restrictive) to self-contained settings (more restrictive). For this current study, the programs studied were as follow: General Education with Related Services (RS) and/or Special Education Teacher Support Services (SETSS); Integrated Co-Teaching (ICT); Special Class in a Community School (SE) or Specialized School (SS). Below is a detailed description of these programs.

General Education. General Education (GE) consists of two different types of programs (RS and SETSS).

Related Services (RS). Related Services are defined as "developmental, corrective and other support services" that require assisting a student with a disability to benefit from instruction. When Related Services are provided to students whose primary program is General Education, they are considered a supplementary aid and service; however, RS may also be a support for students in special classes. Related services may include counseling, hearing education services, occupational therapy (OT), orientation and mobility services (O&M), physical therapy (PT), school health services, speech/language therapy, vision education services, and other support services (NYCDOE SOPM, 2009).

Special Education Teacher Support Services (SETSS). Special Education Teacher Support Services, formerly known as resource room, are specially designed and/or supplemental instruction provided by a special education teacher. A student is either removed from class and taught in a smaller class for a portion of the day (pull-out) or a teacher may come into the classroom to work with the student, a small group of students,

or the classroom teacher during the regular lesson (push-in). The special education teacher may also work with the student's general education teacher to adjust the learning environment and/ methods to meet the student's individual needs (this is called "indirect" instruction) (NYCDOE SOPM, 2009).

Integrated Co-Teaching or Collaborative Team Teaching (ICT or TT). Integrated Co-Teaching (ICT) classrooms include students with disabilities and students who are non-disabled who are educated together with two teachers—a general education teacher and a special education teacher. The teachers work together and collaborate throughout the day to adapt and modify instruction for students and make sure the entire class has access to the general education curriculum. ICT may be provided on a full-time or part-time basis. The periods of ICT must be specified on the student's IEP, along with the content areas of instruction (for example, mathematics) in which he or she will receive the services. The number of students with disabilities may not exceed 40% of the total class register or a maximum of 12 students with disabilities in an ICT class (NYCDOE SOPM, 2009).

Special Class Services. Special Class Services are services provided for children with disabilities in a self-contained classroom for any part of the school day. In self-contained special classes, students must be grouped by similarity of educational needs. Classes may contain students with the same disability or with different disabilities as long as they have similar levels of academic and learning characteristics, levels of social development, levels of physical development and management needs (NYCDOE SOPM, 2009).

Community school. Students may receive special class services part-time or full-time in community school districts and high schools. To afford students with disabilities opportunities to be educated with their non-disabled peers and to enable them to move to a less restrictive placement, the goal is to establish special class services serving 12 students or, for high schools, 15 students in home-zoned schools (NYCDOE SOPM, 2009).

Specialized public schools. Students receiving special class services in specialized schools have severe disabilities and/or limited cognitive abilities combined with physical limitations. They require highly specialized educational, social, psychological, and medical services in order to maximize their potential for both self-fulfillment and for useful and meaningful participation in society. These students may experience severe speech, language, perceptual-cognitive, and/or emotional impairments that interfere with learning. They may also have extremely fragile physiological conditions, potentially requiring personal care, physical/verbal supports, prompts, and/or assistive technology devices. Specialized public school classes are housed either in self-contained school sites or various public school facilities throughout the city. Specialized schools are comprised entirely of students with disabilities, offer special class services full-time, and thus generally provide fewer opportunities for integration with non-disabled peers (NYCDOE SOPM, 2009).

Chapter III

METHODOLOGY

The purpose of Chapter III is to provide detailed information about the methodology pertaining to the study. This section includes a description of the setting, sample, and instrumentation. This chapter also includes information about the research design method, data collection procedures, and analysis.

This study was designed to determine the effectiveness of instructional programs intended to serve English Learners (ELs) with an educational disability attending public schools within NYC. Specifically, this study attempted to ascertain the extent to which EL students attending special education programs in NYC schools achieve academically on the ELA and mathematics state exams. Achievement was also measured by high school graduation outcomes such as on-time graduation rate and type of diploma earned upon projected year of high school completion. Since NYC is the largest school district (made up five boroughs and 32 communities) in the United States, information and results that are obtained from this research could be helpful to other urban school districts to differentiate programs for EL students with disabilities. It is also important to determine, long term, to what degree these programs have become a contributing factor in the students' academic achievement.

In this study, the gaps mentioned previously in the literature were addressed by using quasi-experimental methods to answer four main research questions:

1. When controlling for disability type, ethnicity, gender, and SES, what are the long-term differential effects of instructional program type on English Language Learners classified with an educational disability and their academic trajectories in mathematics and ELA, through middle school, as measured by the NYS assessments?
2. Do these academic trajectories by program vary by ethnicity or type of disability?
3. What are the differential effects of instructional program type on English Learners classified with an educational disability and their graduation rate?
4. What are the differential effects of instructional program type on English Learners classified with an educational disability and the type of diploma earned?

These questions are linked to the greater question of whether specific instructional program types really contribute differentially to academic achievement, as measured by standardized tests and graduation rates, once demographic variables are controlled for. It also speaks directly to the assertions that these instructional programs make a difference. Further, it speaks to the contention that these programs are justified as a policy instrument for school accountability and academic achievement.

Setting and Sample Population

This study took place in NYC, a northeastern state that enrolls over 1.1 million students. According to the data provided by the NYCDOE's Research and Policy Support

Group (RPSG), 73,451 students were enrolled in third grade programs/classrooms in 2006. On average, students in the 2006 class earned an average score of 674 on the NYS Math assessment and 661 on the NYS ELA assessment (highest score possible is 775 and 790 respectively). Table 3.1 provides longitudinal scale score results (mean) for the 2006 Cohort citywide. Tables 3.2 and 3.3 provide Math and ELA results, respectively, based on whether students were classified with an educational disability. Table 3.4 provides Math and ELA results for EL students citywide. Finally, Table 3.5 provides Math and ELA results for the sample of EL students in this study who were classified with a disability.

Out of 73,451 students enrolled in the third Cohort in 2006, 11,906 or 15.7% of these students were Els, and 9,764 or 12.9% were classified as students with a special education disability. By 2011, or their eighth grade year, 4,340 or (5.7%) were classified as both ELs and students with an educational disability.

Table 3.1

NYS Citywide Assessment Results

	Math Mean Score	*N*	ELA Mean Score	*N*
3rd	674	73,413	661	61,478
4th	675	71,199	654	69,933
5th	677	70,005	661	68,781
6th	675	69,290	662	68,002
7th	671	70,362	661	68,377
8th	673	71,555	650	70,083

Table 3.2

NYS Citywide Math Test Results (Mean Score) by Disability Status

	Special Education	*N*	General Education	*N*
3rd	642	11,321	680	62,092
4th	641	12,293	681	58,906
5th	647	12,711	683	57,294
6th	644	12,899	682	56,396
7th	644	12,591	677	57,771
8th	645	12,450	679	59,105

Table 3.3

NYS Citywide ELA Test Results (Mean Score) by Disability Status

	Special Education	*N*	General Education	*N*
3rd	622	9,259	668	52,245
4th	619	12,259	661	57,674
5th	638	12,474	666	56,307
6th	645	13,026	666	54,976
7th	643	12,420	666	55,957
8th	633	12,502	654	57,581

Table 3.4

NYS Citywide Test Results for ELs

	Math Mean Score	*N*	ELA Mean Score	*N*
3rd	653	13,842	621	2,233
4th	651	12,051	623	10,873
5th	654	9,566	635	8,526
6th	652	8,757	643	7,631
7th	650	9,097	638	7,489
8th	657	9,519	627	8,044

Table 3.5

NYS Citywide Test Results for ELs With a Disability

	Math Mean Score	ELA Mean Score	*N*
3rd	649	611	2,297
4th	648	614	2,297
5th	660	642	2,297
6th	652	643	2,297
7th	654	643	2,297
8th	656	638	2,297

Sample Eligibility

The original sample of EL students for Cohort 2006 consisted of 4,340 students with an educational disability. However, the full sample of 4,340 EL students who were enrolled in special education programs in the 2006-2007 school year was not suitable for analysis because it contained students who had not taken at least 6 years of math and ELA assessments, or who had changed schools, or otherwise were not suitable for inclusion in the analysis. This required identifying an analytical reduced sample. Thus, before proceeding to the main analyses, preliminary analyses and data handling were conducted.

After eliminating students with missing assessment scores or demographic data, a total of 2,297 students remained in the reduced sample. Specifically, time-series (longitudinal) data were used on 2,297 students, nested within programs, which were nested with 34 school districts or smaller communities.

The independent variables included in the study were program enrolled in for a minimum of 3 years through middle school, disability type, ethnicity, gender, and SES. Coding for these variables is provided in Table 3.6. Table 3.7 provides frequency information about the sample. The final sample consisted of 1,395 males and 902

females. Nine-hundred and twenty-five students were taught in a General Education (GE) classroom setting for at least 3 years, while 541 students were in an Integrated Co-Teaching (TT) classroom, and 831 were taught in a Special Education (SE) classroom. While 1,875 students received free or reduced lunch, 422 students did not receive free or reduced lunch in the sample. One-hundred and seven students in the sample were White, 93 were Black, 253 Asian, and 1,844 were Hispanic. The mean scaled score on the 2006 New York State ELA Assessment was 611.42, with a standard deviation of 36.23. The mean scaled score on the 2006 New York State Mathematics Assessment was 649.37, with a standard deviation of 31.67.

Table 3.6

Coding for SPSS and SAS Analyses

Variable Name	Scale	Coding
Program	Nominal	1 = General Education (GE) 2 = Integrated Co-Teaching (TT) 3 = Special Education (SE)
Disability Type	Nominal	1 = Emotional Impairment (EI) 2 = Learning Disability (LD) 3 = Other Health Impairment (OHI) 4 = Speech Impairment (SI)
Ethnicity	Nominal	1 = Asian 2 = Black 3 = Hispanic 4 = White
Gender	Nominal	0 = Male 1 = Female
Socioeconomic Status (SES)	Nominal	0 = Does not receive free or reduced lunch 1 = Receives free or reduced lunch
NYS Math Assessment Score (3^{rd}-8^{th})	Scale	Scaled score indicated
NYS ELA Assessment Score (3^{rd}-8^{th})	Scale	Scaled score indicated
Graduation Status	Nominal	0 = Did not graduate in 2016 1 = Graduated in 2016
Diploma/Certificate Type Earned	Nominal	0 = Unknown 5 = Local Diploma 1 = Dropped Out 6 = Regents 2 = Still Enrolled 7 = Advanced Regents 3 = Obtained GED 4 = IEP Diploma

Table 3.7

Descriptive Statistics of Whole Sample

Variables	*N = 2297*	$\bar{x}$	*SD*
1 = General Education (GE)	925		
2 = Integrated Co-Teaching (TT)	541		
3 = Special Education (SE)	831		
1 = Emotional Impairment (EI)	65		
2 = Learning Disability (LD)	1,378		
3 = Other Health Impairment (OHI)	73		
4 = Speech Impairment (SI)	781		
1 = Asian	253		
2 = Black	93		
3 = Hispanic	1,844		
4 = White	107		
0 = Male	1,395		
1 = Female	902		
0 = Does not receive free or reduced lunch	422		
1 = Receives free or reduced lunch	1,875		
2006 NYS Math Results		649.37	31.67
2006 NYS ELA Results		611.42	36.23

Instrumentation

Prior to the 2012 school year when the students in this sample were in elementary or middle school, New York State was following the PreK-12 ELA and mathematics standards that were created in 2005. Thus, math and ELA achievement were measured through the use of the New York State Testing Program (NYSTP) assessment scores. The Office for Standards, Assessment, and Reporting (SAR) were responsible for developing and providing state testing for students who attended private, public, or charter schools within the state of New York.

History of NYSTP

In 1926, Ethel and Willis Clark founded CTB/McGraw-Hill, which currently aids the NYSTP in developing, administering, and helping to score the math and English language arts exams. Educators and administrators throughout the state are also recruited to assist in the development of the New York State tests. Examinations provided by the NYSTP assess students on a wide range of information within each content area. According to Huber (2010), the NYSTP is an assessment that is given each year to students and should be considered valid. In conjunction with the NYCDOE, SAR developed the NYSTP to adequately meet the expectations of NCLB.

NYS ELA exam. The NYS ELA assessment was designed to measure a student's level of competence in relation to NYS ELA standards and was administered to all eligible students in January during the 2006-2011 school years. Four standards applied to K-12 in ELA, which were the concepts measured by the ELA exams. Each standard began by stating that students will read, write, listen, and speak for a specific goal. The goal of Standard 1 was information and understanding. Standard 2 was literary response and expression. Standard 3 was for critical analysis and evaluation, and Standard 4 was for social interaction (NYSED, n.d.). Each of these standards was the basis for the ELA curriculum K-12 in New York State (Zakierski, 2015).

The NYS ELA assessment rendered three types of assessment data. The number of correct answers (raw score) a student gave on the test was converted into the student's "scaled score." The ELA exam utilized scaled scores that were analogous to each grade level, but not vertically scaled between grade levels (NYSED, 2011b). Scaled scores were then divided into four performance levels. These results were used by teachers, school

administrators, superintendents, and central offices to inform district- and school-wide instructional emphasis, to make decisions about student promotions, and to identify areas in need of improvement. They were also reported in aggregate to the general public.

Student levels of competence were measured along a four-point scale following a conversion from scaled scores: (1) not meeting learning standards; (2) partially meeting learning standards; (3) meeting learning standards; and (4) meeting learning standards with distinction (NYSED, 2006). Scaled score results were used in this study for the goal of a more precise statistical analysis. Scaled scores could range from between 475 and 790, based on the students' grade level, with 790 being the maximum achievable score and 475 being the lowest score (NYSED, 2011b).

NYS mathematics exam. The NYS mathematics assessment was designed to measure a student's level of competence in relation to the content and process strands of the NYS Mathematics Learning standards and was administered to all students in March during the 2006-2011 school years. Student levels of proficiency were measured along the same four-point scale as the abovementioned ELA exam. Scaled scores were also used for analysis in this study. The mathematics assessment for students evaluated number sense and operations, algebra, geometry, and measurement. Rather than only assessing their knowledge of isolated skills and facts, students were required to conceptually be able to apply facts and definitions, read and interpret graphs, apply appropriate procedures, and justify methods that are used to solve mathematical problems. For the NYS mathematics assessment, students were able to obtain a maximum scale score of 775, depending on their grade level, and a minimum of 470 points (NYSED, n.d.). During both the ELA and math exam administrations, students with an

educational disability requiring test modifications such as separate location, directions read, a scribe, and/or extended time, according to their Individualized Educational Plan (IEP), were removed from the general education setting for the duration of the assessment period.

High school graduation outcomes. For the purposes of this study, graduates are defined as those students earning a diploma from NYC schools, though in NYS there are specific levels of diplomas students must earn in order to be considered a graduate. Graduation status consisted of whether or not a student graduated within the projected graduation date for the 2006 Cohort (Spring of 2016). Diploma type consisted of the various levels of diplomas that a student could earn upon graduating within NYC.

Specifically, in 2016, in New York State, a student could earn four types of diploma in order to graduate: an IEP diploma, a local diploma, a Regents diploma, and an Advanced Regents diploma. All students can earn a Regents or Advanced Regents diploma; however, only students who meet specific criteria are eligible to graduate with a local diploma, which allows students to graduate with lower exam scores. In addition, IEP diplomas are for students with disabilities who could not meet the requirements for the other three types of diploma, but finished their high school program in the Spring of 2016.

The type of diploma students earn depends on their course credits and scores on specific NYS exams (subject-level Regents exams), as shown in Appendix E. In order for students to graduate, their transcripts and permanent record cards must have indicated the assessment passed and the score achieved, along with confirmation that they earned a high school diploma. For this research, the only measurement on graduation status was

graduated or did not graduate. The level of the diploma or alternate program was also considered and discussed.

Reliability and Validity

Reliability and validity of the ELA and mathematics exams were provided by the NYSED. To ensure trustworthiness, the anonymous status of the participants whose records were analyzed here was maintained by keeping the data confidential. The study utilized valid and reliable measures, as all data were based on NYSED codes and classifications. The test scores analyzed were generated from criteria-referenced state exams, according to testing protocols in the New York City school districts. This ensured both validity and reliability of the data.

Validity

According to Creswell (2003), in order to determine validity, both the content and the scores produced by the test must be analyzed (construct). Expert professional judgment should also play an integral part in developing the definition of what is to be measured, such as describing the universe of the content, generating or selecting the content sample, and specifying the item format and scoring system. In the case of the NYSTP, New York State educators were involved in test construction in various test development stages.

Content validity. Creswell (2003) stated that content validity is what provides evidence that the exam questions are measuring what they are intended to measure. Content validity of the ELA and math exams was carefully matched to specific NYS ELA and math standards and were measured based on how well students performed on the

exams (NYSED, 2011b). In addition, to further determine content validity, an independent study of alignment between the NYS curriculum and the NYS Grades 3-8 ELA tests was conducted using Norman Webb's method. Overall, the results of the study found that the 2006 NYS math and ELA exams for Grades 3-8 assessed the content and measured the appropriate depth described by the NYS Math and ELA Learning Standards (An External Alignment Study for New York State's Assessment Program, Educational Testing Services, April 2006).

Construct validity. Construct validity is the degree to which a test measures what it claims, or purports, to be measuring (Creswell, 2003). It refers to the appropriateness of inferences made on the basis of observations or measurements (often test scores such as the NYS assessments), specifically whether a test measures the intended construct. Constructs are abstractions that are deliberately created by researchers in order to conceptualize the latent variable, which is correlated with scores on a given measure (although it is not directly observable). Multiple forms of evidence described below were used to assess the construct validity of the NYS assessments in ELA and mathematics (Brown, 1996).

Internal consistency. One form of evidence to measure construct validity is internal consistency. High internal consistency demonstrates high validity because it shows that test items are measuring the same domain of skill. Overall, the NYS ELA and mathematics assessments were found to provide high internal consistency and sound evidence of construct validity. For the total populations of students in the state, the reliability coefficients (statistics used to measure internal consistency) ranged from 0.82 to 0.89, and for most subgroups relevant to this study, the reliability coefficient was

greater than 0.80 on the ELA assessments (NYSED, 2006, p. 20). For the mathematics assessments, the reliability coefficients ranged from 0.88 to 0.96 with respect to the total population of students in the state, and for most subgroups, the reliability coefficient was greater than 0.80 (NYSED, 2006, p. 22). Subsequent years were either at or greater than .80 as well (NYSED, n.d.).

Unidimensionality. Other evidence regarding construct validity comes from analyses of the degree to which the test questions conform to the requirements of the statistical models used to scale and equate the tests, as well as to generate student scores. The models require that the items fit the models well and that the questions in a test measure a single domain of skill (that they are unidimensional). According to NYSED, using Q1 statistics, for the 2006-2011 test administration years, the majority of the items displayed good fit across grades and subjects and "provided solid evidence for the appropriateness of the IRT models used to calibrate and scale the test data (Creswell, 2003).

Additional evidence for the efficacy of modeling ability was provided by demonstrating that the questions on NYS ELA (and math) tests are related. What relates the questions is most parsimoniously claimed to be the common ability acquired by students studying the subject. To demonstrate the common factor (ability) underlying student responses on ELA test items, a principal component factor analysis was conducted on a correlation matrix of individual items for each test. Evaluation of eigenvalue magnitude and proportions of variance explained by the main and secondary factors provided evidence of essential unidimensionality of the construct, measured by the ELA and math tests for the analyzed total population and subgroups.

Minimization of bias. To determine if the assessment had effectively minimized item bias, statistical methods were utilized, including analyzing differential item functioning (DIF). DIF methods are a range of techniques that are increasingly being used to evaluate whether different subgroups respond differently to particular items within a scale, after controlling for group differences in the overall domain being assessed (Scott, McPherson, Ramsay, & Campbell, 2002). Four procedures were used to eliminate bias and minimize DIF in the New York State ELA and mathematics tests. First, the developers of the NYSTP tests gave careful attention to questions of possible ethnic, gender, and SES (socioeconomic status) bias. All materials were written and reviewed to conform to the company's editorial policies and guidelines for equitable assessment, as well as NYSED's guidelines for item development. At the same time, all materials were written to NYSED specifications and carefully checked by groups of trained New York State educators. Finally, using statistical methods, it was determined that the magnitude for DIF was small for most items. For those items where the DIF was statistically significant, the items were reviewed. Only items that were deemed free of bias were included in the operational tests.

Reliability

In statistics and psychometrics, reliability is defined as the overall consistency of a measure. According to Klyatis and Anderson (2018), a measure is said to have a high reliability if it produces similar results under consistent conditions. It is the characteristic of a set of test scores that relates to the amount of random error from the measurement process that might be embedded in the scores. Scores that are highly reliable are accurate, reproducible, and consistent from one testing occasion to another.

Because the ELA and math assessment tool scores students based on constructed responses and multiple-choice questions, the reliability of the Grades 3-8 NYS ELA and mathematics assessments were calculated using Cronbach's alpha (Cronbach, 1951) and Feldt-Raju coefficient (Qualls, 1995). These reliability statistics assist in maintaining internal consistency because the assessment tool evaluates students based on two different types of questions (NYSED, n.d.).

"Reliability coefficients provide measures of internal consistency that range from zero to one. High reliability indicates that scores are consistent and not unduly influenced by random error" (NYSED, 2013, p. 77). Reliability scores at or above .80 are considered to have good reliability and internal consistency (Reinard, 2006). For the NYS assessments in ELA and mathematics, all tests given in Grades 3-8 had reliabilities at or above .84 for ELA and at or above .89 in mathematics—a good indication that the tests are acceptable as reliable (NYSED, n.d.). Tables 3.8 and 3.9 below include Cronbach's alpha and Feldt-Raju reliability coefficients for the NYS ELA and mathematics assessments for the 2006 administration.

Table 3.8

2006 New York State ELA Test Reliability

Grade	Cronbach's Alpha	Feldt_Raju
3	.85	.86
4	.89	.90
5	.84	.85
6	.86	.88
7	.88	.89
8	.92	.93

Table 3.9

2006 New York State Mathematics Test Reliability

Grade	Cronbach's Alpha	Feldt_Raju
3	.89	.90
4	.94	.95
5	.90	.91
6	.91	.92
7	.90	.91
8	.93	.94

Design of the Study

This study employed a descriptive and quasi-experimental design approach to determine the association between instructional programs designed to serve ELs with an educational disability and their longitudinal academic outcomes through high school. For this study, it was not possible to develop an experimental design with randomized assignment of subjects for the treatment and control groups. Thus, a three-level mixed linear model was used to answer the first two research questions previously posed. The levels are (a) student, (b) school, and (c) district.

The main independent variable for this study was the three types of instructional program (i.e., General Education, Integrated Co-teaching, Special Education Community School, or Specialized School). The geographic location consisted of the five boroughs of New York City and their 34 community school districts. The dependent variables consisted of the ELA and math academic standardized scores obtained on the state-level assessments administered to students each year (2006-2011). In addition, high school graduation status as well as type of diploma earned (i.e., Local, Regents) within 4 years of entering high school was determined.

Chapter II discussed a number of variables that have an effect on student achievement. Past research indicated that variables such as socioeconomic status (Coleman et al., 1966; Mickelson & Bottia, 2010; Schwartz, 2011), ethnicity (Coleman et al., 1966, Mickelson et al., 2013), and gender (Cheema & Galluzzo, 2013) impact student achievement. The relationship between these variables, including classification of disability and student performance on the NYS assessment for ELA and mathematics, is unknown. However, these variables were used for control purposes. The program type effect on individual student ELA and mathematics achievement was then estimated using a three-level growth curve model in a mixed linear model framework.

To examine the last two research questions, cross-tabulation procedures and logistic regression were conducted to assess if the independent variable(s) predicted the dependent variable(s). Specifically, a binary logistic regression analysis was used to determine the probability of EL students graduating within 4 years upon entering ninth grade after placement in general education, integrated co-teaching/collaborative team teaching, or special education program. The binary logistic regression is an appropriate statistical analysis when the purpose of research is to assess if a set of independent variables predicts a dichotomous dependent variable (Stevens, 2009). To examine the last research question, a multinomial logistic regression was initially conducted to investigate whether independent variable(s) predicted the dependent variable (diploma type), which had more than two categorical levels.

Procedures and Data Collection

Following a letter of request, permission was granted via a permission letter (see Appendix D) to the researcher to use all the requested sources of information by the district's Research and Policy Support Group (RPSG). All applicable data were collected by the district, then placed in an Excel spreadsheet and forwarded to the researcher. Student names were deleted from the data files and assigned ID-coded numbers to maintain anonymity and confidentiality. Each student report contained at minimum but limited to the following requested student-level information: NYS ELA and/or mathematics exam scores for the 2006 through 2011 academic years, gender, socioeconomic status (eligibility for free or reduced lunch), disability classification, ethnicity, EL status, program placement, graduation status, and type of diploma.

Data were collected on EL students whose characteristics were in harmony with NYS system definitions. For the public school system, a child is defined as a child with an educational disability and eligible for the study if he or she had been so identified by the public school system based on the conditions described in PL 94-142, and was being served as such. In addition, an English Learner (EL) is a term the DOE uses to describe students whose native language is not English. School program types were Integrated Co-Teaching or Collaborative Team Teaching (TT), General Education with Related Services or Special Education Teacher Support Services (GE), or Special Education classes within a community school or within a specialized school (SE).

This researcher did not interact with students or families for this study. There were also no visits to the public schools. Besides the standard scores collected for each applicable year on the ELA and mathematic exams, additional data that were collected

include student-level demographic variables above and school/program-level information such as geographical location of schools that students attended.

As mentioned in the sample eligibility section, before proceeding to the main analyses, preliminary analyses were conducted. The statistical software SPSS was used to clean the data, recode the variables, check for missing items, and run descriptive statistics analysis for the major outcome variables. Students missing relevant demographic information for this research were excluded from the study. In addition, multilevel growth modeling procedures were used to analyze the data using SAS, while logistic regression analysis was performed using SPSS.

Data Analysis

This study provided a descriptive and quasi-experimental analysis of the relationship between instructional programs designed to serve ELs with an educational disability and their longitudinal academic outcomes through high school. In order to conduct an examination of achievement in the various programs, students' primary and secondary schooling outcomes were used. Students' math and ELA NYS state exam scores through middle school were utilized. In addition, students' high school outcomes such as graduation status and diploma type earned were reviewed. The data were analyzed through a combination of descriptive statistics, cross-tabulations, mixed linear effect modeling, and logistic regression methods.

This study also attempted to answer Research Questions 1 and 2 using Propensity Score Matching techniques to provide a more balanced sample. This approach is considered exploratory because due to the limited sample size once matched, it was not possible to directly compare all three programs to one another. Instead, only the

Collaborative Team Teaching program was directly compared to the other two programs (TT vs. GE and TT vs. SE). For this reason, the results of the PSM and subsequent LMM analysis are not presented in the main paper, but a description of these methods and results can be found in Appendix A.

Linear Mixed-Effects Model (LMM) Specifications and Assumptions

The present study specifically employed a multilevel growth modeling to examine the changes in ELA and mathematics achievement tests in NYC schools over six time points for a cohort of EL students. In educational and organizational studies, hierarchical data structures are common (Muthén, 2004). For example, a student is assigned to a classroom that is nested within a school that is nested within a particular district, within a state, and so forth. Students tend to become more homogeneous as they have been receiving the same curriculum and instruction and sharing the same learning environment (classroom, school). Thus, students are not independent from one another if they are assigned to the same classroom and school.

In addition, longitudinal data, a special case of repeated measures data, are characterized as having both between-subject and within-subject variation, time-dependent covariates, and missing data (Davis, 2002). Linear mixed-effects modeling methods can accommodate these complex features of longitudinal data whereas traditional methods are limited. More importantly, the approach allows for explicit modeling of the variation between subjects and within subjects.

The term *mixed-effects* refers to the expression of the model into fixed-effects and random-effects. The linear mixed-effects model assumes that the observations follow a linear regression where some of the regression parameters are fixed or the same for all

subjects (or schools), while other parameters are random, or specific to each subject (West, 2009).

The general form of the linear mixed model is as follows:

$$Y_i = X_i\beta + Z_i b_i + \varepsilon_i, \qquad i = 1, 2, \ldots, n$$

where X_i and Z_i are design matrices for fixed-effects β and random-effects b_i respectively. ε_i is a vector of error terms. We have the assumption that

$$b_i \sim N(O, G), \qquad \varepsilon \sim N(O, R_i)$$

Equivalently the form can be expressed in a hierarchical formulation:

$$y_i \mid b_i \sim N(X_i\beta + Z_i b_i + \varepsilon_i,), \text{ where } b_i \sim N(O, G)$$

which yields:

$$y_i \sim N(X_i\beta, V_i), \text{ where } V_i = Z_i G Z_i + R_i$$

The assumptions that the linear mixed-effects model must satisfy are that the random-effects follow a normal distribution with mean zero and general diagnol covariance matrix (Davis, 2002; Laird & Ware, 1982; Verbeke & Molenberghs, 2009); the error terms also follow a normal distribution with mean zero and identity covariance matrix. Finally, the random-effects are assumed to be independent of each other and of the error terms (Davis, 2002; Laird & Ware,1982; Verbeke & Lesaffre, 1996). In other words, the covariance between the random-effects and the error terms is zero (Zeger, Liang, & Albert, 1988).

Overall, a three-level LMM was used for this study because both the data (scores of students over time are nested within students and students are nested within schools and schools are nested within school districts, etc.) and research questions (the school district/program-level/contextual factors have impacts on students' ELA and mathematics outcome) are multilevel in nature (Raudenbush & Bryk, 2002). That is, a three-level

LMM takes into account the clustered nature of the students' scores in their various programs, within the various schools, which are nested within school districts.

An unconditional model was first examined to determine whether there were differences within and/or between school ELA and mathematics achievement in terms of growth factors (i.e., initial status and growth rate). This model is useful for partitioning variation in intercepts and growth rates into components. However, the unconditional model does not provide any information on how school-level characteristics nested within districts are related to changes over time. Therefore, a three-level conditional LMM model was used as a final model.

Level 1 examined the longitudinal trends of the scores of students. Level 2 represented the nesting of students within schools. Level 3 incorporated schools nested within district-level effects on the outcomes. Overall, using the approach adopted by Hong (2004; Hong & Raudenbush, 2005, 2006) and Adelson (2009), this hierarchical model attempted to identify, with greater accuracy, the difference between the instructional program's achievement by accommodating the nested nature of the program environments.

Logistic Regression

For Research Questions 3 and 4, logistic regression methods were used to determine the amount of influence the independent variables, placement in special education instructional programs, gender, SES, ethnicity, and disability type had on EL students graduating on time and earning one of several types of diplomas offered by the NYC public school system. Binary regression was used to answer the third question. Multinomial regression was initially used to answer the fourth question.

Binary regression. To examine the third research question, a binary logistic regression was conducted to assess if the independent variables predicted the dependent variable. The binary logistic regression is an appropriate statistical analysis when the purpose of research is to assess if a set of independent variables predicts a dichotomous dependent variable (Stevens, 2009). This type of analysis can be used when the independent variables (predictors) are continuous, discrete, or a combination of continuous and discrete.

For the third research question, the independent variables were program type, ethnicity, disability, gender, and SES. The dependent variable was graduation rate and consisted of two levels. This analysis permitted the evaluation of the odds of membership in one of the two outcome groups based on the combination of predictor variable values. Evaluation of the logistic regression model included the overall model evaluation and a classification table showing the percentage of correct predictions. The overall model significance for the binary logistic regression was examined using the χ^2 omnibus test of model coefficients. The Nagelkerke R^2 was examined to assess the percent of variance accounted for by the independent variables.

Binary logistic regression analysis was used because by design, it overcomes many of the restrictive assumptions of linear regressions. For example, linearity, normality, and equal variances are not assumed, nor is it assumed that the error term variance is normally distributed.

Multinomial logistic regression. To examine the last research question, a multinomial logistic regression was initially conducted to investigate whether the independent variable(s) predicted the dependent variable, which had more than two

categorical levels. For this research question, the independent variables were program type, disability, ethnicity, gender, and SES. The dependent variable was diploma type (four different types). The overall model significance for the multinomial logistic regression was examined using χ^2coefficient. The Nagelkerke R^2 assessed the variability accounted for of the dependent variable by the independent predictor variables. Individual predictors were assessed by the Wald coefficient. Predicted probabilities of an event occurring was determined by Exp (*B*). The next chapter contains a report of the results. The final chapter, Chapter V, includes discussion, implications, and recommendations based on the results.

Chapter IV

DATA ANALYSIS AND FINDINGS

Introduction

This study focused on the differential effects of different classroom program styles for English Learners (ELs) receiving special education services in New York City (NYC) public schools. The data set included standardized test scores for students, from 2006 to 2011, for both math and English Language Arts (ELA). For each student, the data also contained information about the type of instructional program (General Education, Integrated Co-Teaching, or Special Education) in which they were enrolled. In addition, the data contained information about the students' type of disability, ethnicity, gender, whether that students experienced poverty (receives free or reduced lunch), and high school graduation outcomes (graduation status and diploma type).

The first research question presented related to academic achievement outcomes for students in each instructional program, through middle school, as measured by the NYS mathematics and ELA assessments. The second research question looked at whether the potential differences for the results of Research Question 1were related or dependent on ethnicity or type of disability. The third research question investigated which program was associated with the highest on-time graduation rate. Finally, the fourth research question investigated the type of diploma earned for EL students within these programs.

Sample

Student Profiles

Students identified as ELs are a heterogeneous group depicted by many different native languages, cultures, races, countries of origin, language proficiencies, socioeconomic statuses, educational experiences, and time in the United States (Artiles et al., 2002; Zehler et al., 2003). However, by virtue of the available data, this study treated the EL students as one group. Specifically, the sample for this study was comprised of culturally and linguistically diverse students identified as ELs with an educational disability who received special education services through the NYC public school system. The sample was restricted to the most recent exiting cohort of students (2015-2016 school year) for which the NYCDOE had high school graduation information. Thus, the analytic sample followed one cohort consisting of approximately 2,297 EL students who entered third grade during the 2006-2007 school year and followed them through the 2015-2016 school year when most students were expected to be in the twelfth grade.

All of the students had taken at least 6 years' worth of both Grades 3-8 ELA and math state exams once. Students were also enrolled in a special education program due to NCLB mandates and typically in their home-zoned school. All of the students had an IDEA disability classification. The disability categories examined in this study included Other Health Impairment (OH), Speech and Language Impairment (SI), Learning Disability (LD), and Emotional Impairment (EI), based on state definitions. These are the high-incidence categories and include the majority of students identified for special education and for which enough data were available. Students had to have been classified

with the same disability category and attended the same program for a minimum of 3 years during their elementary through middle school years.

School Profiles

The schools included in this study were located throughout the five boroughs (consisting of 34 school districts) in NYC and were comprised of the elementary through high school grades. The geographical areas for the schools varied in socioeconomic status, number of identified students with disabilities, ethnicity, and gender. For this study, the various instructional programs within the public schools were located in the same community school district and borough. There were approximately 1,614 public schools in the NYCDOE system during the 2006 through 2016 academic years. Of the 1,614 schools, the reduced sample for this study consisted of 564 schools within 34 districts.

Research Questions 1 and 2

The first two research questions are as follows:

1. When controlling for disability type, ethnicity, gender, and SES, what are the long-term differential effects of instructional program type on English Learners classified with an educational disability and their academic trajectories in mathematics and ELA, through middle school, as measured by the NYS assessments?
2. Do these academic trajectories vary by program, by ethnicity, or by type of disability?

A Three-Level Longitudinal Model:
Analysis of the 2006 NYS Assessments Overview

For this study, a subset of data from the 2006-2011 math and ELA NYS assessments were analyzed. In particular, data from a cohort of EL students attending NYC public special education programs were assessed from Grades 3-8, beginning in 2006. The data set contained 33,782 repeated measures from 2,297 students, nested within 564 schools, in 34 districts. The goal of the study was to model trajectories of math and ELA achievement for EL students attending public schools. In addition, an area of particular interest was to determine the effects of specific instructional learning program types on math and ELA achievement, when controlling for demographic variables such as gender, SES, ethnicity, and type of disability.

The goal of the first set of analyses was to fit a population model to estimate the effects of program, while controlling for (disability, ethnicity, gender, and SES) on mean-level academic achievement as well on the trajectory for academic growth. Therefore, a linear mixed-procedure model was used to answer the first two research questions, pertaining to mathematics and ELA academic trajectories.

Both the intercept and slope were considered as random. Random-effects allow parameters to differ within individuals and between individuals (Laird & Ware, 1982; Singer, 1998). In other words, random-effects provide information on the variation in individuals' means and variations in individuals' slopes. Meanwhile, fixed-effects estimate population average effects. Growth modeling allows for the estimation of both fixed-effects and random-effects.

The mixed model was fitted with district as the highest level, school the second level, and students at the lower level. There are main effects for program, time, ethnicity, disability, SES, and gender. There is a random effect (intercept) to account for district-to-district differences that induces correlation among scores for students within a particular school nested within a district. Model selection included checking for interactions among the fixed-effects and checking the necessity of including random intercepts.

Preliminary Analysis

Preliminary examination of the 2006 Cohort data began by exploring the characteristics and structure of the data. The number of students per district was examined by first examining the frequency of students within each district (Table 4.1). Then the frequency per program within the 34 districts was examined (Table 4.2).

In addition, the mean, median, mode, and range were also computed. From Table 4.3, it can be seen that there is a wide and uniform distribution of number of students per district. The number of students ranges from 6 to 232, with a median of 60 students.

Table 4.1

Frequency of Students Within 34 Districts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	01	37	1.6	1.6	1.6
	02	58	2.5	2.5	4.1
	03	40	1.7	1.7	5.9
	04	36	1.6	1.6	7.4
	05	30	1.3	1.3	8.8
	06	179	7.8	7.8	16.5
	07	86	3.7	3.7	20.3
	08	62	2.7	2.7	23.0
	09	120	5.2	5.2	28.2
	10	232	10.1	10.1	38.3
	11	50	2.2	2.2	40.5
	12	79	3.4	3.4	43.9
	13	6	.3	.3	44.2
	14	63	2.7	2.7	46.9
	15	97	4.2	4.2	51.2
	16	9	.4	.4	51.5
	17	27	1.2	1.2	52.7
	18	15	.7	.7	53.4
	19	43	1.9	1.9	55.2
	20	125	5.4	5.4	60.7
	21	71	3.1	3.1	63.8
	22	64	2.8	2.8	66.6
	23	6	.3	.3	66.8
	24	196	8.5	8.5	75.4
	25	74	3.2	3.2	78.6
	26	38	1.7	1.7	80.2
	27	62	2.7	2.7	82.9
	28	82	3.6	3.6	86.5
	29	33	1.4	1.4	87.9
	30	130	5.7	5.7	93.6
	31	72	3.1	3.1	96.7
	32	57	2.5	2.5	99.2
	75	11	.5	.5	99.7
	84	7	.3	.3	100.0
	Total	2,297	100.0	100.0	

Table 4.2

The SAS System

The SAS System

The FREQ Procedure

Frequency
Percent
Row Pct
Col Pct

Table of program by District

program(program)	District(District) 01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	75	84	Total
General Education	90	174	126	96	78	492	216	132	288	522	102	174	12	192	282	18	54	36	114	264	228	102	18	342	240	132	138	180	90	300	168	120	0	30	5550
	0.65	1.26	0.91	0.70	0.57	3.57	1.57	0.96	2.09	3.79	0.74	1.26	0.09	1.39	2.05	0.13	0.39	0.26	0.83	1.92	1.65	0.74	0.13	2.48	1.74	0.96	1.00	1.31	0.65	2.18	1.22	0.87	0.00	0.22	40.27
	1.62	3.14	2.27	1.73	1.41	8.86	3.89	2.38	5.19	9.41	1.84	3.14	0.22	3.46	5.08	0.32	0.97	0.65	2.05	4.76	4.11	1.84	0.32	6.16	4.32	2.38	2.49	3.24	1.62	5.41	3.03	2.16	0.00	0.54	
	40.54	50.00	52.50	44.44	43.33	45.81	41.86	35.48	40.00	37.50	34.00	36.71	33.33	50.79	48.45	33.33	33.33	40.00	44.19	35.20	53.52	26.56	50.00	29.08	54.05	57.89	37.10	36.59	45.45	38.46	38.89	35.09	0.00	71.43	
Integrated Co-Teaching	66	102	84	60	54	276	114	54	168	162	90	102	0	24	138	12	24	36	18	228	60	162	0	438	90	42	90	84	36	276	66	72	6	12	3246
	0.48	0.74	0.61	0.44	0.39	2.00	0.83	0.39	1.22	1.18	0.65	0.74	0.00	0.17	1.00	0.09	0.17	0.26	0.13	1.65	0.44	1.18	0.00	3.18	0.65	0.30	0.65	0.61	0.26	2.00	0.48	0.52	0.04	0.09	23.55
	2.03	3.14	2.59	1.85	1.66	8.50	3.51	1.66	5.18	4.99	2.77	3.14	0.00	0.74	4.25	0.37	0.74	1.11	0.55	7.02	1.85	4.99	0.00	13.49	2.77	1.29	2.77	2.59	1.11	8.50	2.03	2.22	0.18	0.37	
	29.73	29.31	35.00	27.78	30.00	25.70	22.09	14.52	23.33	11.64	30.00	21.52	0.00	6.35	23.71	22.22	14.81	40.00	6.98	30.40	14.08	42.19	0.00	37.24	20.27	18.42	24.19	17.07	18.18	35.38	15.28	21.05	9.09	28.57	
Special Education	66	72	30	60	48	306	186	186	264	708	108	198	24	162	162	24	84	18	126	258	138	120	18	396	114	54	144	228	72	204	198	150	60	0	4986
	0.48	0.52	0.22	0.44	0.35	2.22	1.35	1.35	1.92	5.14	0.78	1.44	0.17	1.18	1.18	0.17	0.61	0.13	0.91	1.87	1.00	0.87	0.13	2.87	0.83	0.39	1.04	1.65	0.52	1.48	1.44	1.09	0.44	0.00	36.18
	1.32	1.44	0.60	1.20	0.96	6.14	3.73	3.73	5.29	14.20	2.17	3.97	0.48	3.25	3.25	0.48	1.68	0.36	2.53	5.17	2.77	2.41	0.36	7.94	2.29	1.08	2.89	4.57	1.44	4.09	3.97	3.01	1.20	0.00	
	29.73	20.69	12.50	27.78	26.67	28.49	36.05	50.00	36.67	50.86	36.00	41.77	66.67	42.86	27.84	44.44	51.85	20.00	48.84	34.40	32.39	31.25	50.00	33.67	25.68	23.68	38.71	46.34	36.36	26.15	45.83	43.86	90.91	0.00	
Total	222	348	240	216	180	1074	516	372	720	1392	300	474	36	378	582	54	162	90	258	750	426	384	36	1176	444	228	372	492	198	780	432	342	66	42	13782
	1.61	2.53	1.74	1.57	1.31	7.79	3.74	2.70	5.22	10.10	2.18	3.44	0.26	2.74	4.22	0.39	1.18	0.65	1.87	5.44	3.09	2.79	0.26	8.53	3.22	1.65	2.70	3.57	1.44	5.66	3.13	2.48	0.48	0.30	100.00

Table 4.3

Analysis Variable: Frequency Count

Mean	N	Std. Deviation	Median	Minimum	Maximum
67.56	34	54.268	60.00	6	232

Next, the distribution of the outcome variables, math and ELA achievement, were examined. The marginal distribution of math and ELA scores, pooling over the 2006-2011 school years, were plotted (Figure 4.1 and 4.3 for math and ELA, respectively). Side-by-side boxplots by year were also created (Figure 4.2 and 4.4 for math and ELA, respectively). Based on Figures 4.1 to 4.4, the marginal distributions looked reasonably normal and growth was fairly linear. In addition, when conditioning on year, the distribution also appeared to be normal, with some increase in mean over time.

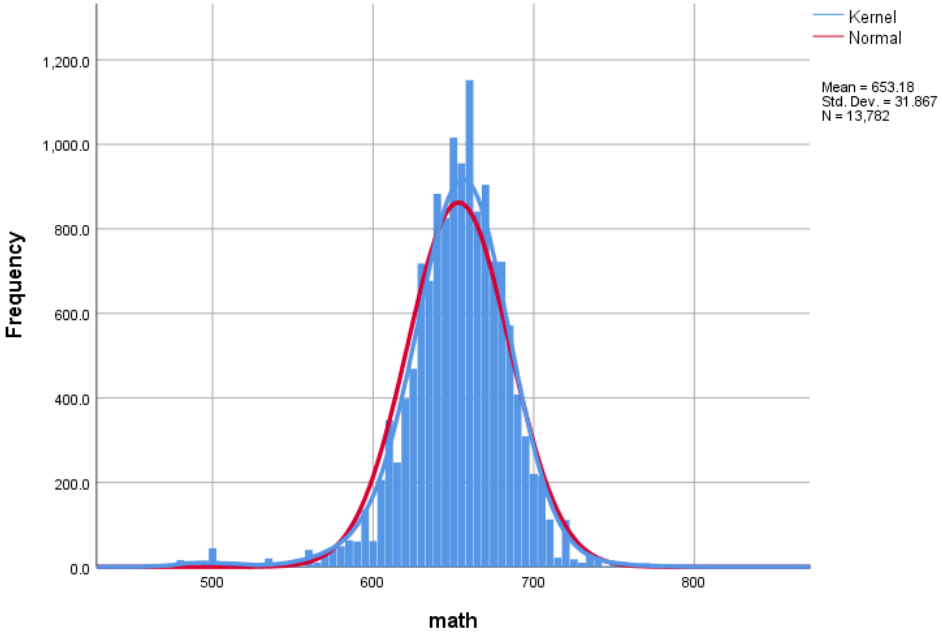


Figure 4.1. Marginal distribution for math

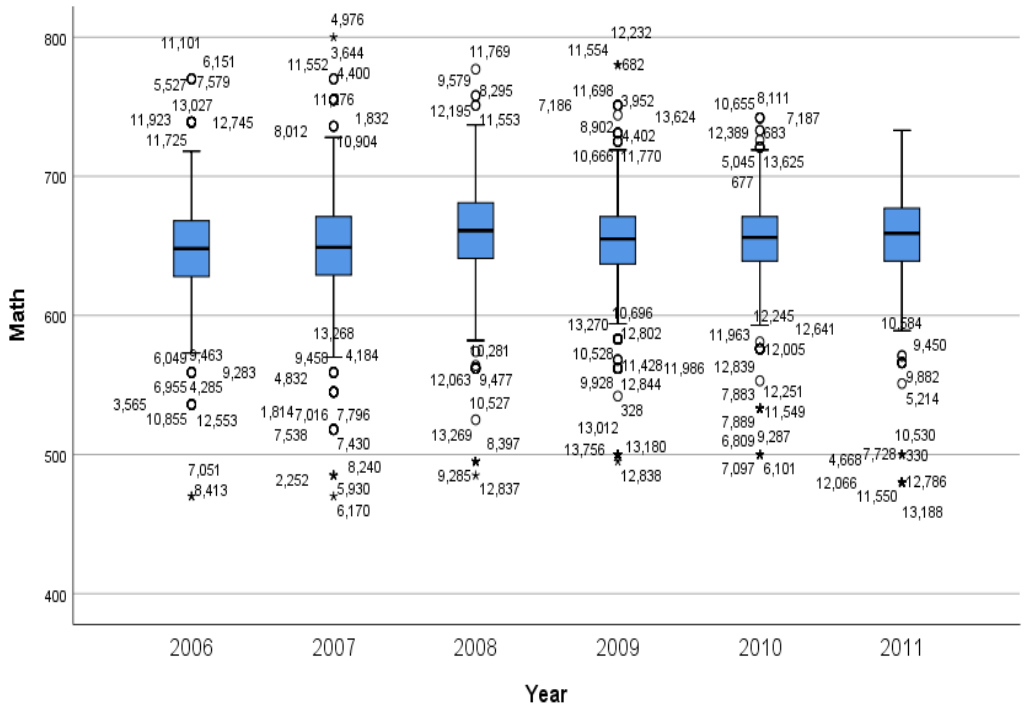


Figure 4.2. Boxplots for math

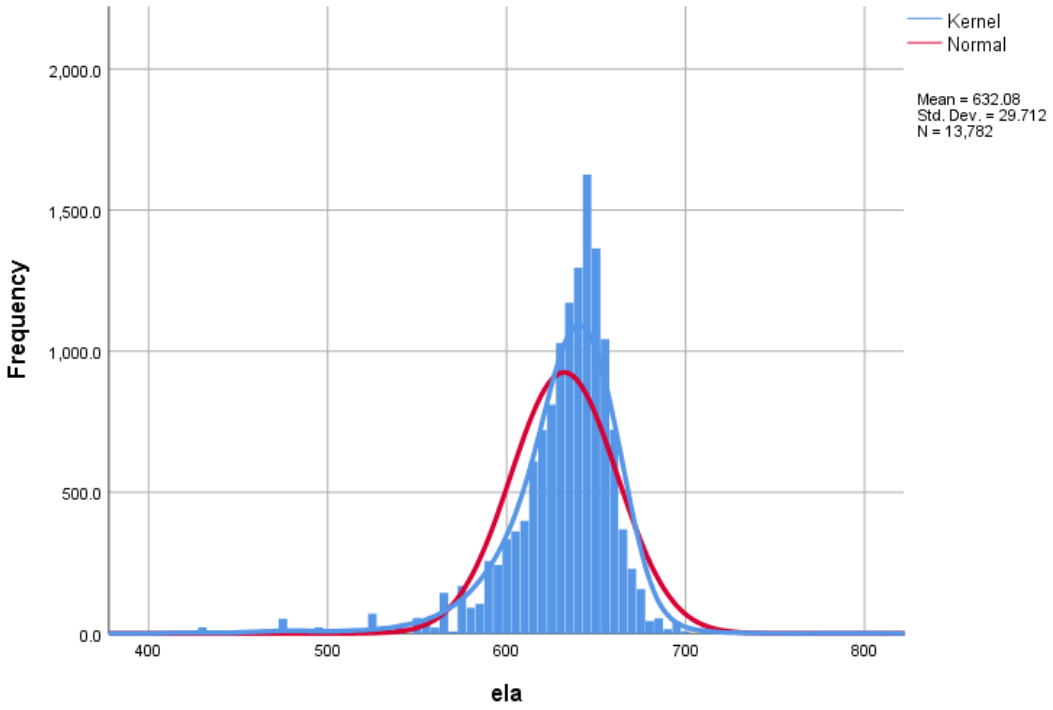


Figure 4.3. Marginal distribution for ELA

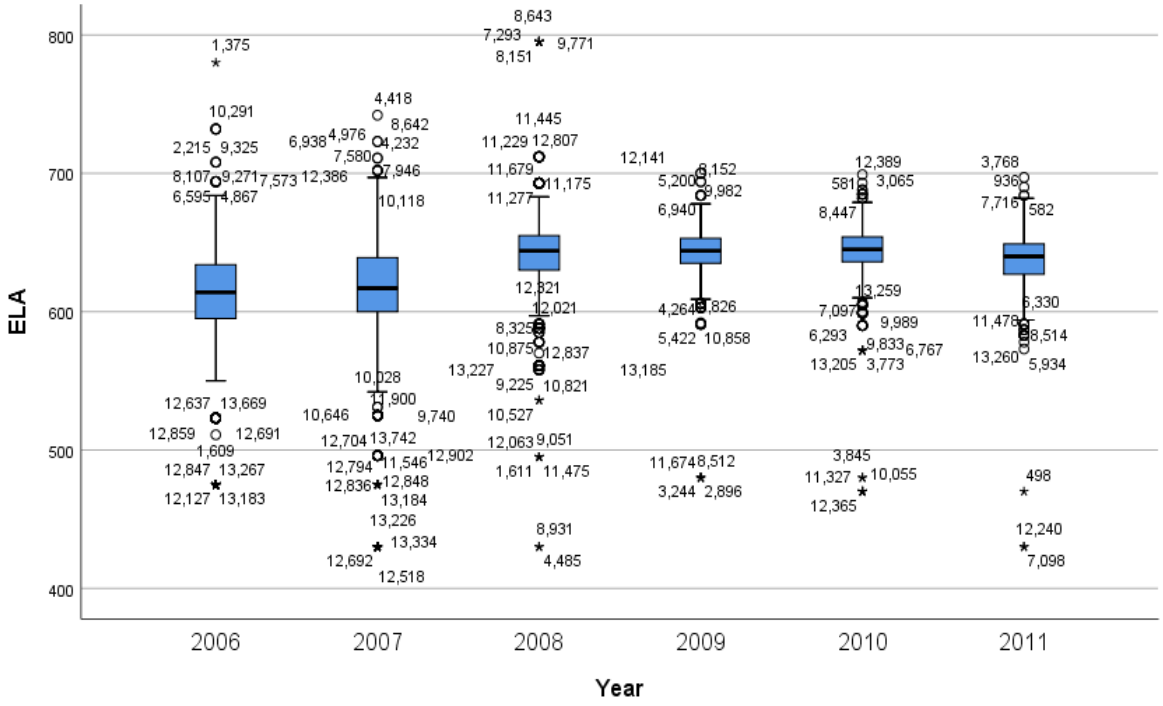
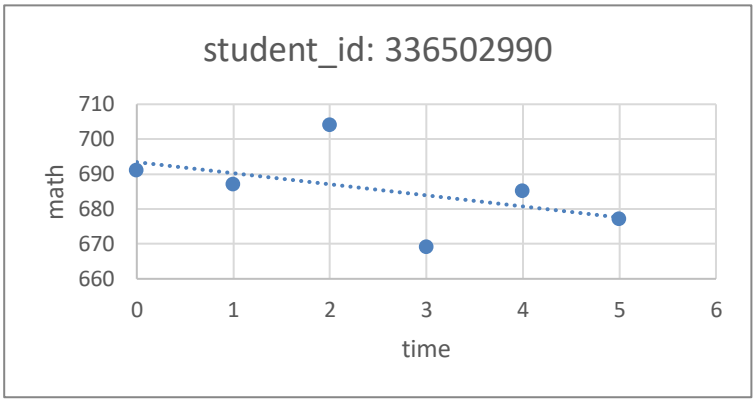
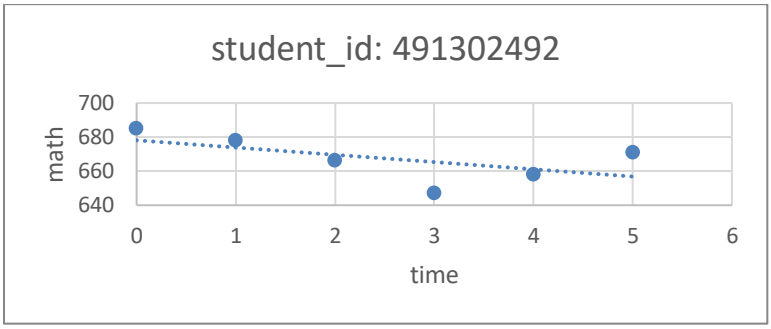
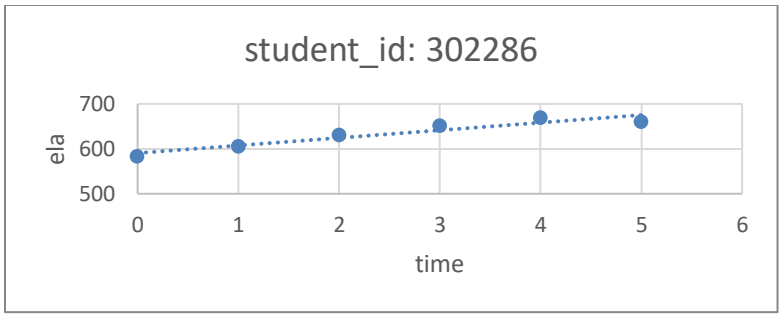


Figure 4.4. Boxplots for ELA

To get a better sense of the functional form of change at the individual level, individual time plots were also examined (see Figure 4.5). There were far too many students to look at each time plot, however. Therefore, a semi-random sample was taken.







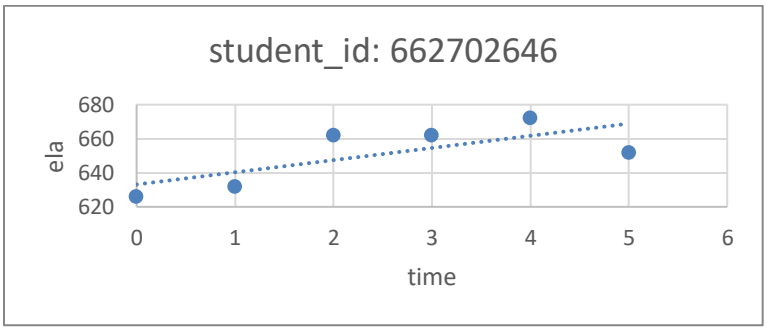


Figure 4.5. Individual student time plots

Plots were also created for math and ELA achievement over time based on instructional program type (see Figure 4.6). Overall, a linear trend was observed for all three programs. Based on both the mean trend and the sampling of individual time plots shown on the previous pages, it was concluded that a linear trajectory model was a reasonable choice. Further, there appeared to be individual differences in both level and rate of change, suggesting the need for random intercepts and slopes, respectively.

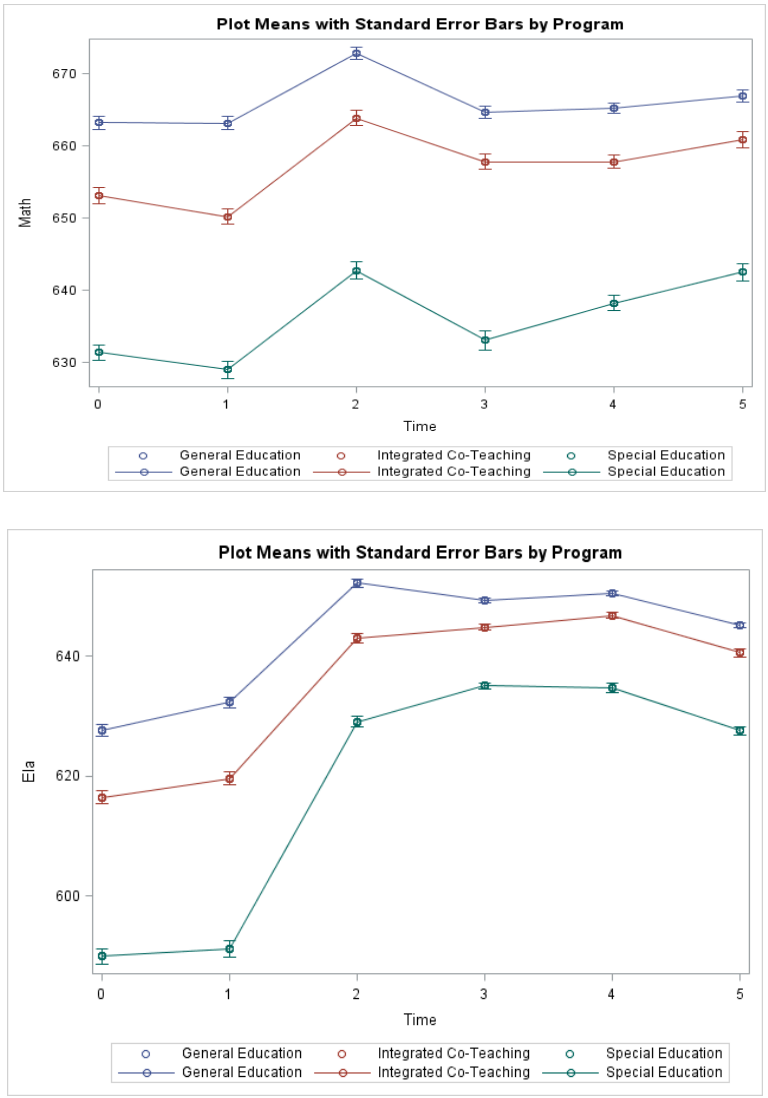


Figure 4.6. Plot means with standard error bars by program

Model Formulation

After a preliminary examination of the data, in order to assess change, a sequence of models from simplest to most complex was developed starting with the base model (Intercept Only or Unconditional Model). The second model used was an unconditional three-level growth model which included only the time variable in order to estimate the academic trajectory across the various groups/factors. For the three-level LLM, the unconditional models were formulated by using no predictors in the model, and the conditional models were expressed with appropriate predictors in the equation. Therefore, a conditional three-level growth model was developed using demographic covariates (Main Effects Growth Model), with the final model consisting of relevant interactions between the cofactors (Interactions Model).

The following assumptions were made for the three-level LLM. The error terms of each level-1 unit should have a mean of zero, and the error terms should be multivariate normally distributed. If, for example, we consider level-1 and level-2 units as students and schools, respectively, then (a) the mean of the error within each school should be zero, and these error terms should be multivariate normally distributed; (b) it is assumed that the relationship between predictors and outcome variables, at all three levels, is linear; (c) another assumption is the homogeneity of variance, that is, all schools should have equal variances in the sample; (d) Level-1 predictors are independent of the level-1 error term. In other words, the covariance between the level-1 predictors and the error term should equal zero; (e) Level-2 and level-3 error terms have a mean of zero and follow a multivariate normal distribution; (f) Level-2 predictors are independent of all level-2 error terms and level-3 predictors are independent of all level-3 error terms; (g)

The level-1 error terms are independent of (uncorrelated to) level-2 and level-3 error terms in the model. That is, the correlation is zero between the level-1 error term and the level-2 error term in the model for the level-1 intercept, or the error term in any of the equations used to estimate the slopes of level-1 variables.

Unconditional model (Intercept Only model). The first model that was fitted to the math and ELA data was the Intercept Only model. This unconditional model can be viewed as a one-way random effect ANOVA model. The outcome variable Y for individual i, in school s, nested in district, is equal to the average outcome in district d, B_{0sd} plus an individual-level error.

Specifically, at Level 1, Y_{isd} is the dependent variable score repeatedly measured for individual i nested within school s, within district d. B_{0sd} is the school mean score across all time points, and e_{sd} is the residual or error term, which indicates the deviation of each individual school score from their mean score. At Level 2, each school's intercept (i.e., school mean score across all individuals), B_{0sd}, is modeled as the group mean of individual school scores, B_{00d}, plus each school's individual deviation from their respective group district mean, U_{0sd}. At Level 3, the district mean score, B_{00d}, is a function of the grand mean across all districts, γ_{000}, and each district's mean deviation from that grand mean, u_{00d}. Given the assumption that the residuals are independent across levels, the model-implied variance of y is the sum of the variance from the different levels of the model.

Model Equations | Assumptions

Level 1 Equation:

$Y_{isd} = B_{0sd} + e_{sd}$ $\quad [\![e_{isd} \sim N(0, \sigma^2)]\!]$

Level 2 Equation: $\quad \left[\!\left[u_{0sd} \sim N(0, \tau_{00}^{(2)})\right]\!\right]$

$B_{0sd} = B_{00d} + u_{0sd}$

Level 3 Equation: $\quad \left[\!\left[u_{00k} \sim N(0, \tau_{00}^{(3)})\right]\!\right]$

$B_{00d} = \gamma_{000} + u_{00d}$

Reduced form:

$Y_{isd} = \gamma_{000} + U_{00d} + U_{0sd} + E_{isd}$

$COV(e_{isd}, u_{sd}) = 0$
$COV(e_{isd}, u_{00d}) = 0$
$COV(u_{0sd}, u_{00d}) = 0$

Variance Decomposition

$V(y_{isd}) = V(u_{00d} + u_{0sd} + E_{isd}) = \tau_{00}^{(3)} + \tau_{00}^{(2)} + \sigma^2$

Unconditional model results. Table 4.4 shows that the average math and ELA achievement score in third grade, pooling over districts and schools, is 652.38 and 632.07, respectively.

Table 4.4

Solution for Fixed Effects for Math and ELA (Intercept Only)

Effect	Estimate	S.E.	DF	t Value	Pr > |t|
Math Intercept	652.38	1.8840	33	346.28	<.0001
ELA Intercept	632.07	1.1495	33	549.87	<.0001

Unconditional three-level linear growth model (Intercept with time). A three-level unconditional growth was then fitted to the data in order to determine the extent of school variability in math and ELA achievement trajectories, and the proportion of the

school level variability that is attributable to the between district differences. The second model includes random intercepts and slopes at both the school and district levels.

Using the reduced form equation below, the terms have been grouped such that the first set of parentheses enclose the fixed parameters (i.e., the average trajectory across schools and districts); the second set of parentheses enclose the random effects at the district level (i.e., variation across districts in average third grade math and ELA achievement and average rate of change in achievement over time); and the third set of parentheses enclose the random effects at the school level (within district differences in schools' third grade math and ELA achievement and rate of change over time).

Model Equations		Assumptions
$Y_{isd} = B_{0jk} + B_{1sd}X_{isd} + e_{isd}$	(level 1)	$[\![E_{isd} \sim N(0, \sigma^2)]\!]$
$B_{0sd} = B_{00d} + u_{0sd}$	(level 2)	$\begin{pmatrix} u_{sd} \\ u_{1sd} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \tau^2_{00} & \\ \tau^2_{10} & \tau^2_{11} \end{pmatrix}\right]$
$B_{1sd} = B_{10d} + u_{1sd}$		
$B_{00d} = \gamma_{000} + u_{00d}$	(level 3)	$\begin{pmatrix} u_{00d} \\ u_{10d} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \tau^3_{00} & \\ \tau^3_{10} & \tau^3_{11} \end{pmatrix}\right]$
$B_{10d} = \gamma_{100} + u_{10d}$		

$$Y_{isd} = (\gamma_{000} + \gamma_{100}X_{isd}) + (u_{00d} + u_{10d}X_{isd}) + (u_{0sd} + u_{1sd}X_{isd}) + e_{isd}$$

Unconditional three-level linear growth model results for math. The fixed effects described in Table 4.5 indicate that the average math achievement score in third grade, pooling over districts and schools, is 649.27, and the average rate of growth is 1.25 per grade or year over time. Even more interesting are the variance component estimates. It can be seen from the magnitude of the estimates that the between-district differences in intercepts and slopes are smaller than the within school differences.

Table 4.5

Covariance Parameter Estimates for Math

Cov Parm	Subject	Estimate
UN(1,1)	District	99.2108
UN(2,1)	District	-2.3213
UN(2,2)	District	0.7990
UN(1,1)	School(District)	387.52
UN(2,1)	School(District)	-23.9929
UN(2,2)	School(District)	2.2023
Residual		774.49

Solution for Fixed Effects for Math					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	649.27	1.9846	33	327.15	<.0001
Time	1.2519	0.2325	14E3	5.38	<.0001

In order to quantify the differences noted above, the ICC for the intercepts and slopes were calculated. From the ICC (see below), 20.4% of school differences in math achievement in third grade were found to be attributed to differences between districts, whereas 26.6% of individual differences in gains over time could be attributed to differences between districts. The vast majority of individual differences, however, resided within districts, as .204 and .266 constituted fairly weak intraclass correlations.

$$ICC_{\beta 0} = \frac{\tau_{00}^{(3)}}{\tau_{00}^{(3)} + \tau_{00}^{(2)}} = \frac{99.2108}{99.2108 + 387.52} = .204$$

$$ICC_{\beta 1} = \frac{\tau_{11}^{(3)}}{\tau_{11}^{(3)} + \tau_{11}^{(2)}} = \frac{.7990}{.7990 + 2.203} = .266$$

Unconditional three-level linear growth model results for ELA. As displayed in Table 4.6, the fixed-effects indicated that the average ELA achievement score in third grade, pooling over districts and schools, was 616.37, and the average rate of growth was 6.29 per year over time. Whereas for the math data, the between-district differences in intercepts and slopes were found to be smaller than the within-school differences, for the ELA data, the between-district differences were greater.

In order to quantify these differences, the ICC for the intercepts and slopes was also calculated for the ELA data. Results indicated that 18.2% of school differences in ELA achievement in third grade could be attributed to differences between districts, whereas 13.3% of individual differences in gains over time could be attributed to differences between districts. Similar to the math data, the vast majority of the individual differences, however, resided within districts.

Overall, the preliminary analyses and unconditional models indicated that math and ELA achievement trajectories were approximately linear with a positive slope. There were both within- and between-district differences in the intercepts and slopes of these trajectories. Trajectories differed more within districts than between districts. In an attempt to explain the within- and between-district variations in math and ELA achievement trajectories, the next two models that were fitted included conditional trajectory models.

Table 4.6

Covariance Parameter Estimates for ELA

Cov Parm	Subject	Estimate
UN(1,1)	District	30.0185
UN(2,1)	District	-4.2706
UN(2,2)	District	0.6334
UN(1,1)	School(District)	135.33
UN(2,1)	School(District)	-18.0646
UN(2,2)	School(District)	4.1187
Residual		695.53

Solution for Fixed Effects for ELA					
Effect	Estimate	Standard Error	DF	T Value	Pr > |t|
Intercept	616.37	1.1873	33	519.15	<.0001
Time	6.2942	0.2201	14E3	28.59	<.0001

$$ICC_{\beta 0} = \frac{\tau_{00}^{(3)}}{\tau_{00}^{(3)} + \tau_{00}^{(2)}} = \frac{30.0185}{30.0185 + 135.33} = .182$$

$$ICC_{\beta 1} = \frac{\tau_{11}^{(3)}}{\tau_{11}^{(3)} + \tau_{11}^{(2)}} = \frac{.6334}{.6334 + 4.1187} = .133$$

Three-level conditional growth model (Main Effects Growth model). Based on the unconditional growth model using school and school nested in district as the random effects, all factors were then added (Main Effects Model), and then their interactions were added sequentially (lower order first, and then if the lower-order factors were significant, corresponding higher-order factors were added). No third-order interaction terms were selected in the final model, which means that terms like time*program*disability, or time*program*ethnicity were insignificant.

The third model included all factors/variables of interest: program, disability, ethnicity, gender, and SES. These co-factors were considered fixed factors in order to estimate their effects on academic growth. Time was the only time-varying covariate. For clarification, special education was the reference group for program; White (or Hispanic) for ethnicity; male for gender; receives free lunch for SES; speech impairment (or LD) for disability type.

Math results. Based on Table 4.7, the basic growth model shows that the estimated average district mean math achievement score, when controlling for the students' SES, gender, disability, and ethnicity, was 637.21 for students in Special Education programs. Furthermore, students in the GE program on average earned math scores that were 33.71 points higher than students in the SE program ($p < 0.001$). Students in the TT program on average earned math scores that were 23.55 points higher ($p < 0.001$) than students in the SE group. Males performed significantly better than females (7.22 points higher). Students with Speech Impairments scored significantly better than students with LD (5.08 points higher). Whereas Hispanics performed significantly better than Black EL students (7.50 points higher), they scored significantly lower scores than Asians (3.57 points lower).

Slope differences were also found among the groups. Though GE students performed the best on average on the math assessments, they had the lowest rate of change or growth per year on average. Though students in the Special Education program scored lower on average in the math assessments, the special education group displayed significantly higher rates of change or growth. The average rate of change for the SE group was 2.45 per year, over the 6-year period. This was significantly higher than both

the GE and TT group who scored 1.9 points ($p < .001$) and .77 points ($p < .031$) lower, respectively. It should also be noted that Asian ELs demonstrated significantly more rates of growth over time, compared to Hispanic students (1.5 points growth per year).

Table 4.7

Solution for Fixed Effects for Math (Conditional Growth Curve)

Solution for Fixed Effects (Conditional Growth Curve)					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	637.13	2.0818	33	306.05	<.0001
Time	1.8609	0.4802	14E3	3.88	0.0001
gender	-7.2167	0.8536	14E3	-8.45	<.0001
SES	-0.6947	1.2424	14E3	-0.56	0.5760
GenEd	33.7099	0.9999	14E3	33.71	<.0001
CoTeach	23.5551	1.1524	14E3	20.44	<.0001
LD	-5.0824	0.9157	14E3	-5.55	<.0001
EI	-1.0418	2.6981	14E3	-0.39	0.6994
OH	-0.4121	2.4438	14E3	-0.17	0.8661
White	-0.1005	2.1524	14E3	-0.05	0.9628
Black	-7.5049	2.4226	14E3	-3.10	0.0020
Asian	3.5712	1.6188	14E3	2.21	0.0274
Time*gender	0.4391	0.2706	14E3	1.62	0.1047
Time*SES	-0.4688	0.3689	14E3	-1.27	0.2038
Time*GenEd	-1.7943	0.3101	14E3	-5.79	<.0001
Time*CoTeach	-0.7707	0.3580	14E3	-2.15	0.0314
Time*LD	0.3921	0.2868	14E3	1.37	0.1716
Time*EI	-0.1305	0.8295	14E3	-0.16	0.8750
Time*OH	0.2584	0.7693	14E3	0.34	0.7370
Time*White	0.3827	0.6520	14E3	0.59	0.5573
Time*Black	0.9334	0.7053	14E3	1.32	0.1857
Time*Asian	1.5225	0.4767	14E3	3.19	0.0014

ELA results. Similar to the math group, Table 4.8 shows that the main effect growth model revealed that, on average, EL students in the SE program had significantly lower ELA achievement scores, but significantly more growth per year. EL students in the SE program had an average ELA score of 599.94 ($p < 0.001$) that increased by 8.13 points per year ($p < 0.001$). EL students in the GE program on average tended to score 37.64 points higher, but 5.28 points lower every year, compared to SE students. EL students in the TT program on average earned 26.16 more points ($p < .0001$), but had a yearly average growth rate of 3.56 points, compared to SE. All other main effects terms were insignificant with the exception of LD when controlling for other effects. Similar to math, EL students with SI performed significantly higher than LD students (7.92 points higher).

Three-level conditional growth model with interactions. From the main effects model, interaction terms were then examined. Interaction effects were assessed for each category before deciding on a final model. This included interaction effects between program and ethnicity, as well as program and disability. In order to assess any slope differences from the different category types, each category was tested for any interaction effect with time, one at a time, until any interaction effect was found, if any. A significant interaction term is one that yields a p-value of less than $\alpha = 0.05$. Various combinations of interaction terms were also considered. A final interaction model was built and is discussed in the next section. The fixed effects in the model are shown same as above. In addition, no third-order interaction terms were selected in the final model (almost none were significant). For clarification, special education was the reference group for program; White (or Hispanic) for ethnicity; male for gender; receives free lunch for SES; speech impairment (or LD) for disability type.

Table 4.8

Solution for Fixed Effects for ELA (Conditional Growth Curve)

Solution for Fixed Effects (Conditional Growth Curve)					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	599.94	1.6338	33	367.20	<.0001
Time	8.1306	0.4355	14E3	18.67	<.0001
gender	1.3578	0.7956	14E3	1.71	0.0879
SES	-0.1057	1.1386	14E3	-0.09	0.9261
GenEd	37.6399	0.9267	14E3	40.62	<.0001
CoTeach	26.1637	1.0684	14E3	24.49	<.0001
LD	-7.9213	0.8507	14E3	-9.31	<.0001
EI	-0.7936	2.4928	14E3	-0.32	0.7502
OH	-0.1533	2.2722	14E3	-0.07	0.9462
White	0.6047	1.9830	14E3	0.30	0.7604
Black	-3.7836	2.1961	14E3	-1.72	0.0849
Asian	-0.6879	1.4848	14E3	-0.46	0.6431
Time*gender	-0.05626	0.2523	14E3	-0.22	0.8235
Time*SES	0.08617	0.3331	14E3	0.26	0.7959
Time*GenEd	-5.2814	0.2872	14E3	-18.39	<.0001
Time*CoTeach	-3.5623	0.3304	14E3	-10.78	<.0001
Time*LD	1.4649	0.2657	14E3	5.51	<.0001
Time*EI	0.07682	0.7704	14E3	0.10	0.9206
Time*OH	0.8367	0.7164	14E3	1.17	0.2429
Time*White	0.3818	0.5974	14E3	0.64	0.5227
Time*Black	0.7697	0.6453	14E3	1.19	0.2330
Time*Asian	0.7677	0.4255	14E3	1.80	0.0712

Math results for the Interaction model. Table 4.9, for the interaction model, shows that each main effect category (when controlling for the other effects) had a significant effect on a student's math score. On average, females performed 5.85 points lower, compared to males. In addition, ELs who received free lunch on average performed 1.84 points lower than students who did not receive free lunch.

The interaction of time and the programs were also found to be significant, indicating the academic trajectories for math are different across programs. Similar to the prior model, students in the SE program, within the same district, had a significantly lower third grade mean of 635.21 and they displayed more growth per year than students in the TT group (.68 points higher; $p = .054$). In addition, the increase per year was 1.76 higher than students in the GE group ($p < .0001$), who had an average third grade mean of 671.52.

The interaction of time and ethnicity was found to be significant with respect to Asians. In general, Asians displayed significantly more growth over time compared to Hispanics (1.51 more points per year; $p = .001$). Though White and Black students who attended GE and Co-teaching programs performed significantly higher than Hispanic students (13.14 and 15.83, respectively; $p < .001$), they had significantly lower scores when attending special education programs (9.33 and 16.46 points, respectively; $p < .001$).

The interaction of time and disability was not found to be significant, indicating that math trajectories were not different across disability type. In addition, no differences were found between the different disability types within the special education program. However, LD students in the GE programs and TT programs earned significantly lower scores (6.64; $p < .001$ and 4.90, respectively; $p = .001$). EI students within GE programs also performed significantly lower compared to SI students in the GE (14.03 lower; $p < .001$), though no significant differences were noted within the other instructional groups. Finally, OH students in the GE programs tended to score significantly better (10.78 points higher; $p = .002$) than LD students in GE.

When using White, male, with LD as the reference group who did not receive free lunch, one also sees significant differences. Though Asian students in special education programs performed 13.64 ($p < .001$) points higher in math than White students, they earned significantly lower scores when attending the GE and TT programs (12.96 and 15.98, respectively, at $p < .001$) in math.

Finally, no third-order interaction terms were selected in the final model, which means that terms like time*program*disability or time*program*ethnicity are insignificant. This indicates that the differences in academic trajectories by programs were the same across disability groups and ethnicity groups.

Table 4.9

Math Results for Interaction Model

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	635.21	1.8633	33	340.90	<.0001
Time	1.8520	0.2976	14E3	6.22	<.0001
Gender	-5.8545	0.5057	14E3	-11.58	<.0001
SES	-1.8396	0.7811	14E3	-2.36	0.0185
GenEd	36.3060	1.2655	14E3	28.69	<.0001
CoTeach	25.4525	1.5274	14E3	16.66	<.0001
LD	-0.1441	0.9180	14E3	-0.16	0.8753
EI	1.5884	1.9287	14E3	0.82	0.4102
OH	-0.5679	2.1350	14E3	-0.27	0.7903
White	-9.3311	2.7554	14E3	-3.39	0.0007
Black	-16.4648	3.0591	14E3	-5.38	<.0001
Asian	4.3039	2.2859	14E3	1.88	0.0597
Time*GenEd	-1.7574	0.3058	14E3	-5.75	<.0001
Time*CoTeach	-0.6817	0.3539	14E3	-1.93	0.0541
Time*White	0.4198	0.6494	14E3	0.65	0.5180
Time*Black	1.0216	0.7020	14E3	1.46	0.1456
Time*Asian	1.5154	0.4725	14E3	3.21	0.0013
GenEd*LD	-6.6442	1.2304	14E3	-5.40	<.0001
GenEd*EI	-14.0318	4.9907	14E3	-2.81	0.0049
GenEd*OH	4.1421	3.3833	14E3	1.22	0.2209
CoTeach*LD	-4.9044	1.4473	14E3	-3.39	0.0007
CoTeach*EI	-0.8716	5.4111	14E3	-0.16	0.8720
CoTeach*OH	0.2596	3.6845	14E3	0.07	0.9438
GenEd*White	13.1367	2.8274	14E3	4.65	<.0001
GenEd*Black	15.8296	3.1871	14E3	4.97	<.0001
GenEd*Asian	0.1720	2.1500	14E3	0.08	0.9362
CoTeach*White	14.6228	3.1421	14E3	4.65	<.0001
CoTeach*Black	10.1783	3.6329	14E3	2.80	0.0051
CoTeach*Asian	-1.3549	2.3857	14E3	-0.57	0.5701

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	625.73	3.1476	33	198.79	<.0001
Time	2.2718	0.6802	14E3	3.34	0.0008
Gender	-5.8545	0.5057	14E3	-11.58	<.0001
SES	-1.8396	0.7811	14E3	-2.36	0.0185
GenEd	42.7985	2.8959	14E3	14.78	<.0001
CoTeach	35.1709	3.2074	14E3	10.97	<.0001
SI	0.1441	0.9180	14E3	0.16	0.8753
EI	1.7324	1.8612	14E3	0.93	0.3520
OH	-0.4238	2.0828	14E3	-0.20	0.8388
Hispanic	9.3311	2.7554	14E3	3.39	0.0007
Black	-7.1337	4.0358	14E3	-1.77	0.0772
Asian	13.6350	3.3781	14E3	4.04	<.0001
Time*GenEd	-1.7574	0.3058	14E3	-5.75	<.0001
Time*CoTeach	-0.6817	0.3539	14E3	-1.93	0.0541
Time*Hispanic	-0.4198	0.6494	14E3	-0.65	0.5180
Time*Black	0.6018	0.9305	14E3	0.65	0.5178
Time*Asian	1.0956	0.7438	14E3	1.47	0.1408
GenEd*SI	6.6442	1.2304	14E3	5.40	<.0001
GenEd*EI	-7.3876	4.9823	14E3	-1.48	0.1382
GenEd*OH	10.7864	3.3345	14E3	3.23	0.0012
CoTeach*SI	4.9044	1.4473	14E3	3.39	0.0007
CoTeach*EI	4.0328	5.3341	14E3	0.76	0.4496
CoTeach*OH	5.1640	3.5888	14E3	1.44	0.1502
GenEd*Hispanic	-13.1367	2.8274	14E3	-4.65	<.0001
GenEd*Black	2.6929	4.1720	14E3	0.65	0.5186
GenEd*Asian	-12.9646	3.4587	14E3	-3.75	0.0002
CoTeach*Hispanic	-14.6228	3.1421	14E3	-4.65	<.0001
CoTeach*Black	-4.4445	4.6815	14E3	-0.95	0.3424
CoTeach*Asian	-15.9777	3.8024	14E3	-4.20	<.0001

ELA results for the Interaction model. Table 4.10, for the interaction model, shows that all the main effect categories in the final model were found to be significant except SES. Males performed significantly better in math. However, for ELA, females performed significantly better (1.34 points higher; $p = .003$).

Consistent with the math model, the interaction of time and program was found to be significant, indicating that the academic trajectories for ELA were different across programs. In general, when controlling for other effects, SE students within the same district earned significantly lower ($p < .0001$) achievement ELA scores than both TT and GE students (39.98 and 26.69 points lower, respectively). However, students in the SE programs displayed more growth per year than students in the TT group (3.52 points higher per year; $p = <.001$). In addition, the increase per year was 5.22 higher than students in the GE group ($p < .0001$).

The interaction of time and ethnicity was found to be significant in the math model; however, it was insignificant for ELA. This indicates the math trajectories were different across ethnicity, regardless of program; however, ELA trajectories were not different across ethnicity. Similar to math, though, Black EL students who attended GE and Co-teaching programs performed significantly better than Hispanic students (11.43 and 11.29, respectively; $p < .001$); they had significantly lower scores when attending special education programs (9.00; $p < .001$). Though White students also tended to perform better in the GE and TT programs and worse in the SE programs, the differences were not significant compared to Hispanics.

Differences were also found when using White, male, with LD as the reference group. Though Black EL students who attended GE programs performed significantly

better than White EL students (8.15; $p = .002$), they had significantly lower scores when attending special education programs (8.39; $p = .002$). No significant differences were found between the TT program; however, Black EL students on average earned higher scores (7.14; $p = .079$).

Whereas the interaction of time and disability was insignificant in the math model, it was found to be significant in the ELA model. Though LD students consistently demonstrated lower scores across all programs when compared to SI students, they demonstrated significantly more growth over time compared to SI students. Students with LD in general had an average ELA score of 593.02 that increased by 1.48 more points ($p < .0001$), compared to SI students. It should also be noted that significant differences were noted between LD and the other disability groups. Both EI and OH students in the special education group earned higher ELA scores (6.51 and 5.21, respectively, with $p = .011$ and .046, respectively). Though no significant differences were noted in the Co-teaching group with respect to disability type, OH students in the general education group tended to perform significantly better than LD students (8.35 points higher; $p = .005$). No other significant differences were found among the disability. In addition, no third-order interaction terms were significant, indicating the differences in academic trajectories by programs were same across disability groups and ethnicity groups.

Table 4.10

ELA Results for Interaction Model

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	598.06	1.4820	33	403.54	<.0001
Time	8.2945	0.3188	14E3	26.02	<.0001
Gender	1.3280	0.4541	14E3	2.92	0.0035
SES	0.1290	0.6519	14E3	0.20	0.8432
GenEd	39.9760	1.1596	14E3	34.48	<.0001
CoTeach	26.6946	1.4024	14E3	19.04	<.0001
LD	-5.0340	1.0706	14E3	-4.70	<.0001
EI	1.4807	2.6385	14E3	0.56	0.5747
OH	0.1804	2.6772	14E3	0.07	0.9463
White	-0.6080	1.9091	14E3	-0.32	0.7501
Black	-8.9984	2.0160	14E3	-4.46	<.0001
Asian	-0.6427	1.6527	14E3	-0.39	0.6974
Time*GenEd	-5.2272	0.2845	14E3	-18.37	<.0001
Time*CoTeach	-3.5256	0.3285	14E3	-10.73	<.0001
Time*LD	1.4769	0.2636	14E3	5.60	<.0001
Time*EI	0.06458	0.7680	14E3	0.08	0.9330
Time*OH	0.8464	0.7142	14E3	1.19	0.2360
GenEd*LD	-5.6916	1.0930	14E3	-5.21	<.0001
GenEd*EI	-7.7721	4.3581	14E3	-1.78	0.0745
GenEd*OH	2.6555	2.9936	14E3	0.89	0.3751
CoTeach*LD	-2.0634	1.2967	14E3	-1.59	0.1116
CoTeach*EI	-3.5657	4.7406	14E3	-0.75	0.4520
CoTeach*OH	-3.6191	3.3035	14E3	-1.10	0.2733
GenEd*White	3.2797	2.4846	14E3	1.32	0.1869
GenEd*Black	11.4308	2.6740	14E3	4.27	<.0001
GenEd*Asian	3.6156	1.8884	14E3	1.91	0.0556
CoTeach*White	4.1570	2.8050	14E3	1.48	0.1384
CoTeach*Black	11.2939	3.0738	14E3	3.67	0.0002
CoTeach*Asian	1.9654	2.1190	14E3	0.93	0.3537

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	592.41	2.2477	33	263.56	<.0001
Time	9.7714	0.2865	14E3	34.10	<.0001
gender	1.3280	0.4541	14E3	2.92	0.0035
SES	0.1290	0.6519	14E3	0.20	0.8432
GenEd	37.5641	2.5605	14E3	14.67	<.0001
CoTeach	28.7882	2.8781	14E3	10.00	<.0001
SI	5.0340	1.0706	14E3	4.70	<.0001
EI	6.5146	2.5700	14E3	2.53	0.0113
OH	5.2144	2.6179	14E3	1.99	0.0464
Hispanic	0.6080	1.9091	14E3	0.32	0.7501
Black	-8.3904	2.7197	14E3	-3.09	0.0020
Asian	-0.03470	2.4250	14E3	-0.01	0.9886
Time*GenEd	-5.2272	0.2845	14E3	-18.37	<.0001
Time*CoTeach	-3.5256	0.3285	14E3	-10.73	<.0001
Time*SI	-1.4769	0.2636	14E3	-5.60	<.0001
Time*EI	-1.4123	0.7549	14E3	-1.87	0.0614
Time*OH	-0.6305	0.7007	14E3	-0.90	0.3683
GenEd*SI	5.6916	1.0930	14E3	5.21	<.0001
GenEd*EI	-2.0805	4.3402	14E3	-0.48	0.6317
GenEd*OH	8.3471	2.9464	14E3	2.83	0.0046
CoTeach*SI	2.0634	1.2967	14E3	1.59	0.1116
CoTeach*EI	-1.5023	4.6749	14E3	-0.32	0.7479
CoTeach*OH	-1.5558	3.2131	14E3	-0.48	0.6283
GenEd*Hispanic	-3.2797	2.4846	14E3	-1.32	0.1869
GenEd*Black	8.1512	3.5634	14E3	2.29	0.0222
GenEd*Asian	0.3359	3.0265	14E3	0.11	0.9116
CoTeach*Hispanic	-4.1570	2.8050	14E3	-1.48	0.1384
CoTeach*Black	7.1369	4.0554	14E3	1.76	0.0785
CoTeach*Asian	-2.1916	3.3869	14E3	-0.65	0.5176

Summary and Conclusions for Questions 1 and 2

Longitudinal data have the feature that measurements are repeatedly collected for the same individual, but typically not in a consistent or constant manner for all subjects. This inconsistency may result in an unbalanced design or missing data. The repeated measurements are correlated, violating the assumptions of independent observations from many traditional statistical methods. However, linear mixed-effects models are a powerful approach to modeling longitudinal data. This approach has the ability to model both between-subject and within-subject variability through random-effects. It can also provide information on individual trajectories and population trajectories, and provides procedures that can handle missing data. Both time-invariant and time-varying covariates can be accommodated in the model as well.

The first two questions of this research sought to determine the differential effects of instructional program type on English Language Learners classified with an educational disability and their academic trajectories in mathematics and ELA, through middle school, when controlling for demographic effects (disability type, ethnicity, gender, and SES). In addition, the purpose was to determine whether program effects varied by EL students' ethnicity or disability type.

After preliminary examination of the data, an unconditional three-level growth model was fitted as well as a conditional three-level growth model incorporating demographic variables as predictors. Results indicated that the academic trajectories for math and ELA are different across programs when controlling other effects. With respect to the conditional model, all the main effect terms in the final models were significant. Though SES was significant in the math final model, it was not significant in the ELA

model. Consistent with past research, males tended to perform significantly better in math across the various programs, while females performed significantly better in ELA in terms of intercept. In addition, though students with higher SES performed significantly better in the math final model, no significant differences were found in the ELA model.

The interaction of time and program was significant in both models, indicating that the academic trajectories for math and ELA were different across programs. The interaction of time and ethnicity was found to be significant in the math model, but not in the ELA model, indicating the math trajectories were different across ethnicity, regardless of program. However, ELA trajectories were not different across ethnicity. In addition, whereas the interaction of time and disability was insignificant in math, it was found to be significant for the ELA data. Specifically, though LD students tended to earn lower ELA scores across all programs, they demonstrated significantly more growth over time.

Overall, the final models for math and ELA revealed that, on average, EL students in the SE program had significantly lower achievement scores, but significantly more growth per year. In addition, GE students tended to perform significantly better on both the math and ELA assessments compared to TT students, but demonstrated significantly less growth per year. It should also be noted that students in general appeared to show more growth per year in ELA than in math, though they obtained lower scores (intercept lower). Finally, no third-order interaction terms were selected in the final model. After examining higher-order interaction effects, it was concluded that the differences in academic trajectories by programs were the same across disability groups and ethnicity

groups. Table 4.11 summarizes each instructional group's respective mean math and ELA scores over time. Each group's scores are compared to the citywide district's score pertaining to typically developing peers (non-disabled peers).

Table 4.11

NYS Citywide Math and ELA Test Results:
Special Education Programs vs. Non-Disabled Group

NYS Citywide Math Test Results: Special Education Programs vs. Non-Disabled Group

	Non-Disabled	General Ed	Team Teaching	Special Ed
3rd	680	669	661	632
4th	681	672	661	633
5th	683	677	670	643
6th	682	673	668	637
7th	677	676	670	644
8th	679	674	670	646

NYS Citywide ELA Test Results: Special Education Programs vs. Non-Disabled Group

	Non-Disabled	General Ed	Team Teaching	Special Ed
3rd	668	633	621	592
4th	661	641	627	596
5th	666	656	646	629
6th	666	654	648	636
7th	666	650	650	636
8th	654	651	644	629

Research Question 3

The third research question was as follows: What is the probability of ELs graduating within four years upon entering the ninth grade when controlling for gender, socioeconomic status, disability type, ethnicity, and program type?

Binary Logistic Regression Results and Analysis

The goal of Research Question 3 was to determine the amount of influence the independent variables—gender, SES, ethnicity, disability, and placement in special education programs/classrooms—had on EL students graduating within 4 years upon entering high school. A binary logistic regression was conducted to answer the third research question. A binary logistic regression is used when running a regression when the dependent variable is dichotomous (Leech, Barrett, & Morgan, 2011). The dependent variable in this case was graduation status outcome. The dependent variable was dichotomous (0 = did not graduate, 1 = graduated). Independent variables were coded as follows: placement in a (1 = GE classroom, 2 = co-taught classroom, 3 = SE), gender (0 = male, 1 = female), SES (0 = no free or reduced lunch, 1 =free/reduced lunch), ethnicity (0 = White, 1 = Asian, 2 = Black, 3 = Hispanic), disability (0 = LD, 1 = OHI, 2 = EI, 3 = SI).

Cross-tabulations were performed. As shown in Table 4.12, for the 675 students where information was available, 45.8% of EL students graduated on time. More specifically, Table 4.13 shows that 53.5% of GE, 46% of TT, and 43% of SE students graduated within 4 years of entering high school for the class of 2006.

Table 4.12

Graduation Rate for Reduced Sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not graduate	366	54.2	54.2	54.2
	Graduated	309	45.8	45.8	100.0
	Total	675	100.0	100.0	

Table 4.13

Graduation Rate by Program

Crosstab					
			Graduated		Total
			Did Not Graduate	Graduated	
Program	General Education	Count	67	77	144
		Expected Count	78.1	65.9	144.0
		% within program	46.5%	53.5%	100.0%
		% within Graduated	18.3%	24.9%	21.3%
		% of Total	9.9%	11.4%	21.3%
	Integrated Co-Teaching	Count	68	58	126
		Expected Count	68.3	57.7	126.0
		% within program	54.0%	46.0%	100.0%
		% within Graduated	18.6%	18.8%	18.7%
		% of Total	10.1%	8.6%	18.7%
	Special Education	Count	231	174	405
		Expected Count	219.6	185.4	405.0
		% within program	57.0%	43.0%	100.0%
		% within Graduated	63.1%	56.3%	60.0%
		% of Total	34.2%	25.8%	60.0%
Total		Count	366	309	675
		Expected Count	366.0	309.0	675.0
		% within program	54.2%	45.8%	100.0%
		% within Graduated	100.0%	100.0%	100.0%
		% of Total	54.2%	45.8%	100.0%

As mentioned, a binary logistic regression was then performed to determine the amount of influence the independent variables—gender, SES, disability, ethnicity, and placement in special education programs—had on EL students graduating within 4 years. The Omnibus Tests of Model Coefficients table displays the model Chi-square and tests for overall significance of the fitted model. The fitted model chi-square was found to be statistically significant ($X^2 = 32.816$, $p < .001$), thus indicating that the fitted model was

able to better predict those students who graduated on time and those who did not (see Table 4.14).

Table 4.14

Omnibus Tests of Model Coefficients: Class of 2006 Graduation Rate

		Chi-square	df	Sig.
Step 1	Step	32.816	10	.000
	Block	32.816	10	.000
	Model	32.816	10	.000

The model summary table (Table 4.15) contains Cox & Snell and Nagelkerke, which provides "pseudo" R^2 estimates. These values gave a rough estimate of the variance that could be predicted from the combination of independent variables (Leech et al., 2011). According to the model summary table, approximately 4.7% to 6.3% of the variance of whether students graduated on time could be predicted from the combination of variables.

Table 4.15

Goodness-of-Fit Statistics: Class of 2006 Graduation Rate

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	898.113[a]	.047	.063

[a]Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

The Block 0 Classification Table (Table 4.16) shows how well the null model correctly classified cases without any variable entered into the model. In this example, if someone were to guess the percentage or number of students who graduated within 4

years upon entering high school, they would classify 54.2% of the students correctly by chance (Leech et al., 2011).

The Block 1 Classification Table (Table 4.17) shows how well the fitted/full model correctly classified cases. In this case, 85% of the students who did not graduate on time were predicted correctly with this model, and 27.5% of the students who did graduate on time were predicted correctly. This indicates that the independent variables were better at helping predict who would not graduate on time versus who would graduate on time. Overall, 58.7% of the cases were classified correctly, an improvement of 4.5% over the null model.

Table 4.16

Block 0 Classification Table: Class of 2006 Graduation Rate

Classification Table[a,b]					
			Predicted		
			Graduated		
	Observed		Did not graduate	Graduated	Percentage Correct
Step 0	Graduated	Did not graduate	366	0	100.0
		Graduated	309	0	.0
	Overall Percentage				54.2
[a]Constant is included in the model.					
[b]The cut value is .500.					

Table 4.17

Block 1 Classification Table: Class of 2006 Graduation Rate

Classification Table[a]					
			Predicted		
			Graduated		
	Observed		Did not graduate	Graduated	Percentage Correct
Step 1	Graduated	Did not graduate	311	55	85.0
		Graduated	224	85	27.5
	Overall Percentage				58.7
[a]The cut value is .500.					

Table 4.18 presents the findings of the binary logistic regression analysis and shows the logistic regression coefficient, Wald test, and odds ratio for each of the predictors. Employing a .05 criterion of statistical significance, one of the ethnicity dummy variables had a significant partial effect. In addition, two of the disability dummy variables had significant partial effects. Though not significant, the odds ratio for gender indicates that when holding all other variables constant, males were 1.030 times more likely to graduate on time compared to females.

With respect to ethnicity, only Asians demonstrated significantly more on-time graduation rates compared to Hispanics. Asians were 3.1 times likely to graduate on time. Although insignificant, Black ELs were 2.15 times more likely to graduate on time and White ELs were 1. 84 times more likely compared to Hispanic students.

The disability variable was dummy coded using LD individuals as the reference group. Only SI ELs demonstrated statistically significant effects. SI students were 1.5 times more likely to graduate on time.

The program type variable was dummy coded using students enrolled in GE programs as the reference group. Though not significant, students enrolled in TT were 25.3% less likely to graduate on time compared to GE students. SE students were 32.3% less likely to graduate on time compared to GE students. In order to make other inferences, SE was then used as the reference group. Though almost significant, with this scenario, GE students were 1.48 times more likely to graduate on time compared to SE students, $p = .052$. No significant differences were noted between TT and SE students ($p = .458$).

Table 4.18

Logistic Regression Analysis: Class of 2006 Graduation Rate

Variables in the Equation									
								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	gender(Male)	.029	.164	.031	1	.860	1.030	.746	1.421
	Ethnicity			15.379	3	.002			
	White	.611	.476	1.647	1	.199	1.842	.725	4.683
	Asian	1.134	.334	11.531	1	.001	3.108	1.615	5.981
	Black	.766	.416	3.384	1	.066	2.150	.951	4.862
	disability			9.989	3	.019			
	LD	-.402	.169	5.649	1	.017	.669	.480	.932
	OH	-.404	.483	.700	1	.403	.668	.259	1.720
	EI	-1.288	.520	6.121	1	.013	.276	.100	.765
	No F. Lunch	.079	.209	.144	1	.704	1.083	.719	1.631
	program			3.787	2	.151			
	GE	.391	.201	3.784	1	.052	1.478	.997	2.191
	TT	.099	.212	.219	1	.640	1.104	.729	1.672
	Constant	-.139	.187	.550	1	.458	.870		
[a]Variable(s) entered on step 1: gender, ethnicity, disability, SES, program.									

Variables in the Equation									
								95% C.I.for EXP(B)	
		B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Female	-.029	.164	.031	1	.860	.971	.704	1.341
	ethnicity			15.379	3	.002			
	Asian	.523	.568	.849	1	.357	1.687	.555	5.134
	Black	.155	.621	.062	1	.803	1.167	.345	3.944
	Hispanic	-.611	.476	1.647	1	.199	.543	.214	1.380
	disability			9.989	3	.019			
	OH	-.002	.477	.000	1	.997	.998	.392	2.544
	EI	-.885	.516	2.940	1	.086	.413	.150	1.135
	SI	.402	.169	5.649	1	.017	1.495	1.073	2.083
	Free Lunch	-.079	.209	.144	1	.704	.924	.613	1.392
	Program			3.787	2	.151			
	TT	-.292	.250	1.360	1	.244	.747	.457	1.220
	SE	-.391	.201	3.784	1	.052	.677	.456	1.003
	Constant	.569	.534	1.138	1	.286	1.767		
[a]Variable(s) entered on step 1: gender, ethnicity, disability, SES, program.									

Variables in the Equation									
								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Female	-.029	.164	.031	1	.860	.971	.704	1.341
	Free Lunch	-.079	.209	.144	1	.704	.924	.613	1.392
	disability			9.989	3	.019			
	OH	-.002	.477	.000	1	.997	.998	.392	2.544
	EI	-.885	.516	2.940	1	.086	.413	.150	1.135
	SI	.402	.169	5.649	1	.017	1.495	1.073	2.083
	ethnicity			15.379	3	.002			
	Asian	.523	.568	.849	1	.357	1.687	.555	5.134
	Black	.155	.621	.062	1	.803	1.167	.345	3.944
	Hispanic	-.611	.476	1.647	1	.199	.543	.214	1.380
	program			3.787	2	.151			
	GE	.292	.250	1.360	1	.244	1.339	.820	2.186
	SE	-.099	.212	.219	1	.640	.906	.598	1.372
	Constant	.278	.528	.276	1	.599	1.320		
[a]Variable(s) entered on step 1: gender, SES, disability, ethnicity, program.									

Research Question 4

The final question for the research study is as follows: What are the differential effects of instructional program type on ELs classified with an educational disability and the type of diploma earned (IEP, local or Regents degree)? To examine the last research question, a multinomial logistic regression was conducted to investigate whether the independent variable(s) predicted the dependent variable, diploma type, which had more than two categorical levels. However, due to limited sample size within certain categories, cross-tabulations (see Table 4.19 and 4.20 below) and binary logistic regression were performed to describe the relationship between program type and type of level of diploma earned overall as well as specific high school outcomes. Specifically, due to the limited sample, this study could only focus on IEP, local diploma, and Regents diploma (the two types) in order to perform the logistic regression analysis. Local and IEP diplomas were combined to form one category. The two Regents diploma types formed another category. Since there were no longer more than two categories for diploma type, binary logistic regression was used to see if there was a difference in the type of program on their odds of getting the diploma. Table 4.21 and 4.22 describe the results of earning the local_IEP and Regents diploma, respectively.

Table 4.19

Diplomas Earned Per Program

Categorical Variables Codings				
			Parameter coding	
		Frequency	(1)	(2)
Program	Co Teaching	54	.000	.000
	General Education	76	1.000	.000
	Special Education	170	.000	1.000

Table 4.20

High School Outcome for Instructional Programs

			Program			Total
			General Education	Integrated Co-Teaching	Special Education	
Outcome	Dropped Out	Count	18	19	61	98
		% within Outcome	18.4%	19.4%	62.2%	100.0%
		% within program	12.5%	15.1%	15.1%	14.5%
		% of Total	2.7%	2.8%	9.0%	14.5%
	Still Enrolled	Count	46	48	166	260
		% within Outcome	17.7%	18.5%	63.8%	100.0%
		% within program	31.9%	38.1%	41.0%	38.5%
		% of Total	6.8%	7.1%	24.6%	38.5%
	GED	Count	3	1	4	8
		% within Outcome	37.5%	12.5%	50.0%	100.0%
		% within program	2.1%	0.8%	1.0%	1.2%
		% of Total	0.4%	0.1%	0.6%	1.2%
	IEP Diploma	Count	1	4	4	9
		% within Outcome	11.1%	44.4%	44.4%	100.0%
		% within program	0.7%	3.2%	1.0%	1.3%
		% of Total	0.1%	0.6%	0.6%	1.3%
	Local Diploma	Count	38	34	124	196
		% within Outcome	19.4%	17.3%	63.3%	100.0%
		% within program	26.4%	27.0%	30.6%	29.0%
		% of Total	5.6%	5.0%	18.4%	29.0%
	Regents (w/o Advanced Distinction) Diploma	Count	36	20	46	102
		% within Outcome	35.3%	19.6%	45.1%	100.0%
		% within program	25.0%	15.9%	11.4%	15.1%
		% of Total	5.3%	3.0%	6.8%	15.1%
	Advanced Regents Diploma	Count	2	0	0	2
		% within Outcome	100.0%	0.0%	0.0%	100.0%
		% within program	1.4%	0.0%	0.0%	0.3%
		% of Total	0.3%	0.0%	0.0%	0.3%
Total		Count	144	126	405	675
		% within Outcome	21.3%	18.7%	60.0%	100.0%
		% within program	100.0%	100.0%	100.0%	100.0%
		% of Total	21.3%	18.7%	60.0%	100.0%

Table 4.21

Regents Diploma

Variables in the Equation									
								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	program			12.209	2	.002			
	program(GE)	.997	.285	12.205	1	.000	2.711	1.549	4.744
	program(TT)	.382	.325	1.375	1	.241	1.465	.774	2.771
	Constant	-1.023	.172	35.441	1	.000	.359		

[a]Variable(s) entered on step 1: program.

Variables in the Equation									
								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	program			12.209	2	.002			
	program(GE)	.616	.358	2.957	1	.086	1.851	.918	3.735
	program(SE)	-.382	.325	1.375	1	.241	.683	.361	1.292
	Constant	-.642	.276	5.398	1	.020	.526		

[a]Variable(s) entered on step 1: program.

Table 4.22

IEP_Local diploma

Variables in the Equation									
								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	program			12.209	2	.002			
	program(TT)	.616	.358	2.957	1	.086	1.851	.918	3.735
	program(SE)	.997	.285	12.205	1	.000	2.711	1.549	4.744
	Constant	.026	.228	.013	1	.909	1.026		

[a]Variable(s) entered on step 1: program.

Variables in the Equation									
								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	program			12.035	2	.002			
	program(GE)	-.531	.363	2.132	1	.144	.588	.289	1.199
	program(SE)	.461	.330	1.946	1	.163	1.586	.830	3.031
	Constant	.531	.282	3.546	1	.060	1.700		

[a]Variable(s) entered on step 1: program.

Results for Type of Diploma Earned

Using Special Education as a reference group, results indicated that General Education students were 2.71 times more likely to earn the Regents degree ($p = .000$), whereas Special Education were 2.71 times more likely to earn the Local or IEP diploma type compared to GE students ($p = .000$). No significant differences were noted between students in the Co-teaching programs and the other two programs with respect to either diploma type.

Logistic regression summary results for Questions 3 and 4. Logistic regression analysis was employed to answer the third and fourth research questions and predict the probability that an EL student would graduate within 4 years upon entering high school and earn a type of diploma. The predictor variables were student's gender, SES, three dummy variables coding ethnicity, three variables coding disability type, and two dummy variables coding the type of program in which the student was enrolled.

A test of the full model versus a model with intercept only was statistically significant, χ 2 (10, N = 675) = 32.816, $p < .001$. The model was able to correctly classify 27.5% of those who graduated on time and 85% of those who did not, for an overall success rate of 58.7%. Based on the analysis, there were no significant different differences between the programs and graduating within 4 years upon entering the ninth grade. Placement in a TT or SE classroom/program setting for EL students did not have a statistically significant influence on the probability of graduating on time when controlling for gender, SES, ethnicity, and disability type, when compared to each other. Though almost significant, GE students were 1.48 times more likely to graduate on time compared to SE students, $p = .052$.

In terms of type of diploma earned, results indicated that General Education students were more likely to earn the Regents degree, whereas Special Education students were more likely to earn the Local or IEP diploma type compared to GE students. No significant differences were noted between students in the Co-teaching programs and the other two programs with respect to either diploma type. Table 4.23 describes the type of diploma earned by different subgroups of students citywide in comparison to the EL students for this current study.

Table 4.23

Citywide Graduation Rate and Type of Diploma Earned (Percentage)

Group	Graduation Rate	Regents Diploma	Local Diploma	IEP Diploma
All students	70.5%	66.4%	4.1%	1%
Non ELs	73.6%	69.6%	3.9%	.8%
Non SWD	76.4%	75.3%	1%	NA
ELs	40.5%	35.7%	4.8%	2.6%
SWD	41.1%	21.9%	19.2%	5.5%
2006 EL/SWD Cohort	45.8%	15.4%	29%	1.3%
GE	53.5%	26.4%	26.4%	.7%
TT	46%	15.9%	27%	3.2%
SE	43%	11.4%	30.6%	1.0%

Chapter V

DISCUSSION

Introduction

This study, an examination of special education instructional programs for English Learners in NYC schools, was done by comparing longitudinal academic achievement outcomes for students in three specific instructional academic programs. The topic of academic outcomes for English Learners (ELs) has received significant attention from the research community in recent years. EL students, or children whose native language is not English, are predicted to be 40% of the U.S. school-age population by the 2030s (Thomas & Collier, 2002). Education research, policy, and practice related to this group of students have been profoundly affected by major legal and legislative decisions, such as the *Pennsylvania Association for Retarded Children (PARC) v. Commonwealth of Pennsylvania* (1972) and *Mills v. Board of Education of the District of Columbia* (1972), which paved the way for the inclusion of students with disabilities into mainstream classrooms; *Diana v. State Board of Education* (1970), which informed school districts regarding the way EL students should be assessed and identified for Special Education services; and the No Child Left Behind (NCLB) Act of 2001, requiring all students to meet minimum levels of proficiency in English Language Arts (ELA) and mathematics by 2014, including subpopulations such as those categorized as Limited

English Proficient (LEP) (Abedi & Dietel, 2004). More recently, the Every Student Succeeds Act (ESSA), which is an extension to NCLB, includes many of the same requirements as NCLB. However, ESSA gives more flexibility to the states, rather than federal mandates, in how those requirements are to be met.

These decisions, in connection with demographic growth, have contributed to a growing concern for the academic achievement outcomes for EL students. This has been reflected in the large number of programs, scholarships, and policies targeting EL students with and without disabilities. Large-scale assessment data and policy reports on the achievement outcomes of EL students have suggested that the achievement gap with non-minority language populations is both sizeable and persistent (Fry, 2007; Rampey, Dion, & Donahue, 2009). Often of significant concern in studies examining EL student trajectories is the school environment in which EL students find themselves, including the language services available to them, the racial/ethnic composition of their schools, their opportunity to learn, and the quality of instruction they receive (Rolstad, Mahoney, & Glass, 2005; Wang & Goldschmidt, 1999). Aside from these school-related factors, empirical studies since the 1960s have consistently shown that non-school factors, including household income, childhood health, and parental education, help to explain more of the variation in student achievement than school-level factors (Battistich, Solomon, Kim, Watson, & Schaps, 1995; Ladd, 2012). In addition to these factors, this current study also examined the impact of other non-school factors that past research has shown to impact student achievement such as gender (Cheema & Galluzzo, 2013), classification of disability, and ethnicity (Coleman et al., 1966, Mickelson et al., 2013).

Purpose and Review of Methods

Using existing data from the NYC DOE, this study was designed to evaluate the long-term academic performance achievement of ELs attending Collaborative Team Teaching programs compared to their cohort counterparts attending two different instructional programs (General Education and Special Education). Specifically, contrasts were made to examine the associations among school-age ELs' instructional programs and students' longitudinal academic outcomes in ELA and mathematics as well as high school graduation outcomes. Prior research on this topic was built upon by focusing on academic outcomes through high school, by comparing the effectiveness of the instructional academic models (rather than linguistic programs), and by evaluating whether these special education programs were differentially effective for students of different ethnic backgrounds and type of disability.

The sample for this study was restricted to the most recent exiting cohort of students (2015-2016 school year) for which the NYCDOE had high school graduation information. Thus, the analytic sample followed one cohort consisting of approximately 2,297 EL students who entered third grade during the 2006-2007 school year and followed them through the 2015-2016 school year when most students were expected to be in the twelfth grade. The schools included in this study were located throughout the five boroughs, consisting of 564 schools within 34 school districts, in NYC and were comprised of elementary through high school grades. The geographical areas for the schools varied in socioeconomic status, gender, ethnicity, and number of identified students with disabilities.

In order to conduct an analysis of achievement in the various programs, students' math and ELA state exam scores, as well as high school graduation outcomes information, were utilized. The data were analyzed through a combination of descriptive statistics, cross-tabulations, mixed linear modeling, and logistic regression methods. Specifically, for the first two questions, this study used a three-level mixed linear model, controlling for the nested nature of students' scores over time. This permitted inferences about effects over time (student scores over time), schools, and schools within district levels. Logistic regression procedures were used to answer the last two questions.

Summary of Findings

For this study, the first research question presented involved the academic achievement outcomes for students in each instructional program (GE, TT, and SE), through middle school, as measured by the NYS mathematics and ELA assessments, when controlling for other demographic factors. The second research question sought to investigate whether the potential differences for the results of Research Question 1 were related to or dependent on ethnicity or type of disability. The third research question investigated which program was associated with the highest on-time graduation rate. Finally, the fourth research question investigated the type of diploma earned for EL students within these programs.

Four key findings are worth noting in this study. First, results indicated that there are substantial differences in academic performance in both math and ELA among EL students, particularly in terms of rates of growth over time. Specifically, academic trajectories for math and ELA are different across programs when controlling for other

effects. Second, all main effects were found to have significant differences. For example, students with higher SES tended to perform significantly better in both ELA and mathematics. Though males tended to perform better in math, females performed better in ELA. Third, differences in program effects by ethnicity as well as disability were also found. Finally, after examining higher-order interaction effects, it was concluded that differences in academic trajectories by programs were the same across disability groups and ethnicity groups; thus, no third-order significant interactions were found.

Research Questions 1 and 2 Findings

The first two questions of this research sought to determine the differential effects of instructional program type on English Learners classified with an educational disability and their academic trajectories in mathematics and ELA, through middle school, when controlling for demographic effects (disability type, ethnicity, gender, and SES). In addition, the purpose was to determine whether program effects varied by EL students' ethnicity or disability type. After preliminary examination of the data, an unconditional three-level growth model was fitted as well as a conditional three-level growth model incorporating demographic variables as predictors.

Key findings for Question 1. Federal requirements pertaining to schools, such as NCLB and more recently ESSA, have led to an increase of inclusion classrooms for school-age children throughout the nation (Nichols et al., 2010). With ESSA, the USDOE has given more flexibility to the states to determine how federal mandates regarding assessing students' academic achievement will be met. However, all students must still be assessed annually to determine academic progress. In addition, individual schools, school districts, and states must publicly report test results in the aggregate and for specific

student subgroups, including low-income students, students with disabilities, English Learners, and major racial and ethnic groups. This, combined with more emphasis on annual assessments, has led to finding an instructional/program model that best fits the needs of students and one that will increase academic achievement.

Recent research at the middle school level has demonstrated that students with disabilities benefit academically on standardized assessment measures when educated with their non-disabled peers in an inclusion classroom setting (Rea, McLaughlin, & Walther-Thomas, 2002). However, as the inclusion model has evolved, examining new models and their impact on all students has been essential. Current research demonstrated that the co-taught inclusive classroom, which is similar to the Collaborative Team Teaching offered in NYC schools, can have a positive impact on academic achievement for special education students (Mastropieri et al., 2005; Murawski, 2006; Murawski & Swanson, 2001). Consistent with past research, this current study showed that EL students attending instructional programs with typically developing peers (GE and TT programs) also tended to perform better than students attending self-contained, special education programs.

Specifically, results indicated sizeable differences in program effects on EL outcomes in both ELA and math, indicating that the academic trajectories for math and ELA are different across programs. Overall, when controlling for demographic effects, the final models for the final sample in math and ELA revealed that, on average, EL students in the SE program had significantly lower achievement scores, but significantly more growth per year compared to the other two programs. In addition, GE students tended to perform significantly better on both the math and ELA assessments compared

to TT students, but demonstrated significantly less growth per year. It should also be noted that students in general appeared to show more growth per year in ELA than in math. This could be due to EL students gaining more competence in the English language over time.

Key disability type findings for Question 2. According to Olson (2004), although students with disabilities, as a group, tend to achieve in the lower half of the distribution of achievement, individuals with disabilities can be found across the full range of academic performance. For example, a 2003 report from the Office of Special Education Programs found that with the exception of Intellectual Impairments, student with learning disabilities tended to be more behind in ELA compared to other disability types. Furthermore, there were fewer disability-related differences with respect to mathematics than for reading performance (USDOE, 2003).

For this study, the interaction of time and disability was found to be significant for ELA, but not for math. Consistent with the Office of Special Education Programs report, LD students consistently demonstrated lower scores across all programs when compared to SI students with respect to ELA scores. However, they demonstrated significantly more growth over time compared to SI students. Significant differences were also noted between LD and the other disability groups. Both EI and OH students in the special education group earned higher ELA scores. Though no significant differences were noted in the Co-teaching group with respect to disability type, OH students in the general education group tended to perform significantly better than LD students. Therefore, LD students appeared to benefit from the Team Teaching (direct instruction of the additional certified teacher) model compared to the other programs.

The interaction of time and disability was not found to be significant in the math model, indicating the math trajectories were not different across disability type. In addition, no differences were found between the different disability types within the special education program. However, LD students in the GE programs and TT programs earned significantly lower scores. Furthermore, EI students within GE programs also performed significantly lower compared to SI students in the GE, though no significant differences were noted within the other instructional groups.

No other significant differences were found among the disability and other groups. In addition, no third-order interaction terms were significant, indicating the differences in academic trajectories by programs are the same across disability groups. It should be noted, however, that overall SI students tended to earn higher scores compared to the other groups and benefited from a more inclusive type approach to education. LD students, however, seemed to benefit more from the added structure seen in the TT classrooms with respect to learning math.

Key ethnicity findings for Question 2. The issue of the disproportionate representation of ethnic and linguistic minority groups in special education has been discussed in the professional literature for several decades now (Dunn, 1968; Hosp & Reschly, 2003). In addition, recent reports of the NAEP (2009) have shown that, while math scores have increased nationally, the achievement gap between Hispanic and White students has not changed significantly at either Grade 4 or 8 from 1990 to 2009. It is also reported that, while reading scores increased for both groups significantly, the achievement gap between Hispanic and White students did not change for fourth or

eighth graders when comparing 1992 to 2009. Similar data have been reported for the achievement gap between White and Black students (NAEP, 2007a, 2007b).

In the Valentino and Reardon (2014) study, Chinese ELs consistently earned higher test scores in both math and ELA compared to Hispanic EL students. While this current study showed similar gaps between White and Hispanic EL students, the results for Black and Asian EL students were mixed. Specifically, for this study, the interaction of time and ethnicity was found to be significant in the math model but not in ELA model, indicating the math trajectories were different across ethnicity, regardless of program. However, ELA trajectories were not different across ethnicity. Consistent with the Valentino and Reardon study, in general, Asians displayed significantly more growth over time compared to Hispanic EL students. Though not significant, they also displayed more growth over time compared to White EL students. In addition, though Asian students in special education programs performed higher in math than White students, they earned significantly lower scores when attending the GE and TT programs in math. This was slightly different than the Valentino and Reardon study which showed EL student earning higher scores.

Next, results for this study revealed that Black EL students had more success attending the two inclusion programs (GE and TT) rather than the self-contained special education programs. Past research has consistently shown an achievement gap between White and Black students and no significant differences between black and Hispanic students in both math and ELA. For this study, though, White and Black students who attended GE and Co-teaching programs earned significantly higher math scores than Hispanic students, and they had significantly lower scores when attending special

education programs. While White ELs also tended to perform better in the GE and TT programs and worse in the SE programs, the differences were not significant compared to Hispanics with respect to ELA scores.

Similar to math, though, Black EL students who attended GE and Co-teaching programs performed significantly better than Hispanic students, and they had significantly lower ELA scores when attending special education programs. Achievement gaps between White and Black EL students were also noted. Black EL students tended to earn significantly lower ELA scores than White EL students when attending special education programs. They performed better, however, than White EL students when attending TT programs and significantly better when attending GE programs. After examining higher-order interaction effects, it was concluded that the differences in academic trajectories by programs were the same across ethnicity groups; thus, no third-order interaction terms were found to be significant.

Key Findings for Research Question 3

The third research question for this study sought to determine the probability of ELs graduating within 4 years upon entering the ninth grade, when controlling for gender, socioeconomic status, disability type, ethnicity, and program type. Binary logistic regression analysis was used to answer the third question and predict the probability that an EL students would graduate within 4 years upon entering high school. For the 675 (out of the original 2,297) students, where information was available, 45.8% of EL students graduated on time. More specifically, 53.5% of GE, 46% of TT, and 43% of SE students graduated within 4 years of entering high school for the class of 2006.

Based on the analysis, there were no significant different differences between the programs and graduating within 4 years upon entering the ninth grade. Placement in a TT or SE classroom/program setting for EL students did not have statistically significant influence on the probability of graduating on time when controlling for gender, SES, ethnicity, and disability type, when compared to each other. Though almost significant, GE students were 1.48 times more likely to graduate on time compared to SE students, $p = .052$. Overall, no particular instructional model appeared to result in significantly higher probability of on-time graduation rates. However, based on the results, it can be seen that students who had the opportunity to engage with typically developing peers displayed higher on-time graduation rates.

Nonetheless, this was still far below the on-time graduation rate for the 2006 Cohort for nonnative speakers. According to the NYCDOE, the overall citywide graduation rate for the 2011 Cohort increased to 70.5%, up 2.1 percentage points from 68.4% for the 2010 Cohort. However, only about 41% of students with disabilities in the 2011 Cohort graduated within 4 years, as did 40.5% of ELs. Graduation rates for Black and Hispanic students continued to lag behind those of their White and Asian peers. In the 2011 Cohort, while 85% of Asian students and 82% of White students earned their diplomas by August of 2016, only 65.4% of Black students and 64% of Hispanic students had hit that mark (NYCDOE, 2016).

Key Findings for Research Question 4

The final question for the research study investigated which type of diploma EL students with disabilities were more likely to earn upon graduation based on the programs in which they were enrolled. Due to the limited sample, this study could only focus on IEP, local diploma, and Regents diploma (the two types) in order to perform the logistic regression analysis. Local and IEP diplomas were merged to form one category. The two Regents diploma types formed another category. Binary logistic regression was then used to see if there were differences in the type of program on their odds of getting the diploma.

Using Special Education as a reference group, results indicated that General Education students were 2.71 times more likely to earn the Regents degree ($p = .000$), whereas Special Education were 2.71 times more likely to earn the local or IEP diploma type compared to GE students ($p = .000$). No significant differences were noted between students in the Co-teaching programs and the other two programs with respect to either diploma type. However, students attending the Co-teaching programs were more likely to earn the Regents diploma compared to SE students, and more likely to earn the local or IEP diploma compared to GE students. Therefore, it can be seen that students who had the opportunity to learn alongside typically developing peers had the tendency to earn the higher-level diploma.

Practical Implications

Over the past 30 years, researchers have alluded to the fact that language minority students are inappropriately overrepresented in special education. However, many of

these studies have not purely examined English Language Learners as an isolated variable or group. Rather, data collection, analyses, and findings are typically presented in aggregate format, consolidating race, ethnicity, and linguistic backgrounds into a single category most commonly referred to as "minority," "ethnic minority," or "linguistic minority." When data are disaggregated, the most common comparisons are between race and ethnicity. In other words, variations by ethnicity, disability category, grade level, language proficiency level, and type of language support are rarely examined when looking at issues of representation.

This study went a step further by analyzing only EL students with disabilities and limiting the study to specific subgroups of students. By doing this, the study was able to narrow down relationships between programs and students with four different disability categories (within school, nested within districts) for four different ethnic groups. Therefore, this study speaks to the effectiveness of three distinct and very specific program models, primarily for four groups of ELs—White, Black, Hispanic, and Asian—as well as four groups of disability type—Speech Impairment, Learning Disability, Emotional Impairment, and Other Health Impairment.

Nonetheless, this study has several limitations, as discussed in the first chapter of this study. In addition to the limitations previously discussed, another significant implication that can be garnered from this study is that with complex models as the ones performed for this study, there is always some uncertainty with respect to model specification, such as which terms to include. Thus, more research with similar models is needed.

In addition, as mentioned previously, with respect to the design of the study, it was not possible to develop an experimental design with randomized assignment for the treatment or control group. Therefore, this study employed a descriptive and quasi-experimental design approach to determine the relationship between instructional programs designed to serve ELs with an educational disability and their longitudinal academic outcomes through high school. While non-experimental design is used frequently in education research, it is not as reliable as experimental research. In order to alleviate this potential selection bias, different procedures such as propensity score matching could have been utilized to provide a more balanced sampling technique. Therefore, in order to further investigate the impact of Collaborative Team Teaching programs compared to the other two programs when controlling for demographic variables, as discussed in the Methods chapter, propensity score matching procedures were used in conjunction with linear mixed methods. A detailed description of these methods and results can found in Appendix A.

Future Directions

Although the number of empirical research studies continues to grow, overall there is still limited research on the impact of various instructional programs for EL students with disabilities. This study provides empirical evidence to add to the existing body of research. Additional studies on the topic of EL students with disabilities could assist policymakers as well as district and school leaders on how to properly implement the various inclusion models, recognize which EL students would be best served within the specific programs/model, and develop strategies to continue the model's success after

implementation. Future research in this area could include, but is not limited to, the following:

1. Conduct a longitudinal study in which the interaction between number of years in the three specific programs and academic achievement is analyzed from Grades 3-11.
2. Design a mixed-methods study in which school- and district-level factors are taken into account, such as school SES.
3. Future research should also focus on the long-term success of EL students educated in specific bilingual special education programs. These studies can help contribute to the ongoing debate about the most effective methods of bilingual special education. These studies also can impact the way bilingual special education is viewed as well as contribute to implementing more bilingual special education programs which aid in closing the achievement gap between EL students and Native English peers.
4. Recreate this study, consisting of a three-level mixed model analysis, in conjunction with propensity score matching for selecting an unbiased sample, in order to answer the first two research questions previously posited.

Conclusion

The lack of knowledge base regarding how to best address the needs of ELs in Special Education can be found in schools today. It is important that individuals such as school principals, school psychologists, bilingual coordinators, and Special Education teachers working with students who are ELs in Special Education understand what their

needs are and how to best address them. The goal of education is to educate every child and provide him or her with the appropriate resources and supports so all children can be successful. Therefore, developing effective inclusive programs that promote student achievement is essential because these programs tend to include the population most in need of improvement. In addition, the different programs in Special Education need to continue to provide language support to all EL students in Special Education. Although a great challenge, for ELs with disabilities it is the first critical step in ensuring equity and opportunity in learning.

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Appendix A

Propensity Score Matching Method

(once students and school programs are matched on observed characteristics.)

As discussed in the Methods and Discussion chapters, in order to further answer questions one and two and to alleviate the potential selection bias, an exploratory propensity score matching was utilized to provide a more balanced sampling technique. In conjunction with propensity score matching for selecting an unbiased, overall sample, a 3 level mixed linear model was used.

Chapter 2 discussed a number of variables that have an effect student achievement. Past research indicates that variables such as socioeconomic status (Coleman et al., 1966; Mickelson & Bottia, 2010; Schwartz, 2011), ethnicity (Coleman et al., 1966, Mickelson et al., 2013), and gender (Cheema & Galluzzo, 2013), impact student achievement. The relationship between these variables, including classification of disability and student performance on the New York State Assessment for ELA and Mathematics is unknown. However these variables were used for propensity score matching and control purposes. Specifically, propensity score models were used to identify and match students placed in ICT programs, to similar students placed in the two other special education programs. This approach was used to more closely approximate a randomized experiment. The program type effect on individual student ELA and mathematics achievement was then estimated using a 3 level growth curve model in a mixed linear model framework.

Rational for PSM and Data Analysis

Propensity score matching (PSM). As in most cases in educational research, it is difficult to conduct true experimental designs with random assignment of subjects and treatments because researchers tend to rely on observational data such as program type and academic performance. Therefore these types of studies are subject to significant bias (i.e., systematic, as opposed to random, differences between treatment and control groups). One way to address this limitation is through close matching of control and treatment units, minimizing the differences between them, and in theory allowing the comparison of similar to similar units. In this manner, one approximates an experimental situation where the only average difference between the comparison units is the treatments (Rosenbaum & Rubin, 1983).

In this study, investigation of the relationship of the independent variables, placement in special education programs, on the dependent variable, academic achievement outcomes was analyzed. In order to best determine this relationship, random assignment into the treatment and control groups should be used. However, as explained, with most cases in educational research, non-experimental methods must be used because it is unethical to use random assignment (Adelson, 2013). In this case, the student population in the study were placed in their respective programs prior to the study, as it is frequently the IEP team (typically Committee on Special Education in NYC), parent or administrator that determines the classroom placement of a student. This in a sense could be deemed bias because of the lack of randomization. These decisions are often made because of certain student variables, meaning the treatment is not independent of these student variables. As a result, when conducting research of this type, analytical

procedures are required to adjust for bias. Therefore, the final two samples for statistical analysis were obtained through the use of propensity score matching (PSM).

PSM is used to reduce selection bias, allowing for the comparison of groups as if the selection of the sample were randomized. Specifically, PSM pairs like students in the sample population from the program groups (i.e., TT paired to Special Class and TT paired to GE). The matched pairs method used in PSM is also known as "nearest neighbor matching" (Stone & Tang, 2013). In order to complete "nearest neighbor matching," a propensity score must be calculated. "A propensity score is a single summary score that represents the relationship between multiple observed characteristics for group members and treatment group members" (Stone & Tang, 2013). Students are paired based on similarity of observable characteristics (Dehejia and Wahba, 2002).

Propensity score matching for this sample was completed using "SPSS". In the case of this study, the variables gender, socioeconomic status, ethnicity, disability type, district of attendance, and initial academic performance was used for the propensity score. According to Dehejia and Wahba (2002), matching "units" (in this case students) "provide a natural weighting scheme that yields unbiased estimates of the treatment impact" (p. 151). By creating a single summary score from a number of covariates, propensity scores lead to more stable results (Adelson, 2013). PSM helps the research obtain quasi-randomization by matching individuals in the control group to the experimental group by their propensity score (Adelson, 2013) and helps to strengthen arguments involving causation (Randolph, Falbe, Manuel, & Balloun, 2014). The results of the PSM analyses construction appear in Appendix B for the General Education and

Integrated Co-Teaching matches. Appendix C reports the analysis construction for the Integrated Co-Teaching and Special Education matches.

After PSM, a total of 880 students were included in the sample from Grades 3-8 for the GE vs. TT group (440 in each group). Table A.1 provides descriptive information about the sample. Six independent variables, gender, SES, disability type, ethnicity, past academic performance, and program setting, were included in the PSM calculations. Four hundred and ninety-eight males and 382 females were included in the PSM sample. Six hundred and ninety-six students received free or reduced lunch, while 184 students in the sample did not receive free or reduced lunch. Forty-one students in the sample were White, 114 Asians, 42 Blacks, and 683 Hispanics. Five hundred and seventy-eight students were classified as a student with a learning disability, 271 Speech Impairment, 9 Emotional Impairment, and 22 OHI. The mean scaled score on the 2006 New York State ELA Assessment was 620.93, with a standard deviation of 22.435. The mean scaled score on the 2006 New York State Math Assessment was 656.96, with a standard deviation of 25.038.

Table A.1

Descriptive Statistics of TT vs. GE Sample after PSM Calculations

Frequency Table

	N = 880	$\bar{x}$	*SD*
0 = General Education (GE) 1 = Integrated Co-Teaching (TT)	440 440		
1 = Emotional Impairment (EI) 2 = Learning Disability (LD) 3 = Other Health Impairment (OHI) 4 = Speech Impairment (SI)	9 578 22 271		
1 = Asian 2 = Black 3 = Hispanic 4 = White	114 42 683 41		
0 = Male 1 = Female	498 382		
0 = Does not receive free or reduced lunch 1 = Receives free or reduced lunch	184 696		
2006 NYS Math Results (Total Sample)	880	656.96	25.038
2006 NYS ELA Results (Total Sample)	880	620.93	22.435
2006 NYS Math Results (GE Group)	440	657.35	24.426
2006 NYS ELA Results (GE Group)	440	621.05	23.537
2006 NYS Math Results (TT Group)	440	656.57	25.657
2006 NYS ELA Results (TT Group)	440	620.81	21.302

For math, the TT vs. SE group, a total of 606 students were included in the (303 in each group). Table A.2 provides descriptive information about the sample. Six independent variables, gender, SES, disability type, ethnicity, past academic performance, and program setting, were included in the PSM calculations. Three-hundred and fifty three males and 253 females were included in the second PSM sample. Four hundred and ninety students received free or reduced lunch, while 116 students in the sample did not receive free or reduced lunch. Twenty-three students in the sample were White, 45 Asians, 20 Blacks, and 518 Hispanics. Three hundred and ninety-seven students were classified as a student with a learning disability, 171 Speech Impairment, 17 Emotional Impairment, and 21 OHI. The mean scaled score on the 2006 New York State

ELA Assessment was 608.69, with a standard deviation of 25.267. The mean scaled score on the 2006 New York State Math Assessment was 644.55, with a standard deviation of 25.126.

Table A.2

Descriptive Statistics of TT vs. SE Sample after PSM Calculations

	N = 606	$\bar{x}$	*SD*
0 = Integrated Co-Teaching 1 = Special Education	303 303		
1 = Emotional Impairment (EI) 2 = Learning Disability (LD) 3 = Other Health Impairment (OHI) 4 = Speech Impairment (SI)	17 397 21 171		
1 = Asian 2 = Black 3 = Hispanic 4 = White	45 20 518 23		
0 = Male 1 = Female	353 253		
2006 NYS Math Results	606	644.55	25.126
2006 NYS ELA Results	606	608.69	25.267
2006 NYS Math Results (TT Group)	303	643.91	24.323
2006 NYS ELA Results (TT Group)	303	607.55	26.209
2006 NYS Math Results (SE Group)	303	645.19	25.929
2006 NYS ELA Results (SE Group)	303	609.82	24.279

A linear mixed procedure model was then run to answer the first two research questions, pertaining to Mathematics and ELA academic trajectories. The mixed model was fit with district as the highest level, program the second level and with students at the lower level. Similar to the full sample, there are main effects for program, time, ethnicity, disability, SES, and gender.

Statistical Math Modeling Results for PSM Sample. The final sample of students for the GE & TT cohort of 2006 for the most part yielded mixed results compared to the full sample. Similar to the reduced sample, the "Tests of Fixed Effects" table, shows that

each main effect term had a significant effect on a student's math score difference. Similar to the full sample, the interaction of time and program was found to be significant in the PSM sample. Students attending TT programs earned lower scores than GE students, however displayed significantly more growth overtime. Whereas TT students in the full sample earned initial lower scores compared to the SE students, in the PSM sample, it was the TT students who earned lower scores initially. In addition, unlike the full sample, overall students clearly benefitted from attending the TT programs, as the students attending TT programs displayed significantly more growth overtime, in the end earning significantly higher scores.

Whereas the interaction of time and ethnicity was significant in the reduced sample, it was found to be insignificant in the GE_TT sample. However it was significant in the TT_SE sample. Here we also see that Asian perform significantly better across all reference groups, with the exception of the Co-teaching group. Here we see that there is not a significant difference in score between White ELs and Asian EL students.

In addition, whereas significant differences were noted between Black and Hispanic students in the full sample, no significant differences are noted between Black and Hispanic EL students in the PSM sample for Math. However, significant differences are noted between White ELs compared to Black and Hispanic EL students. Whereas Black and Hispanic ELs perform significantly better in the GE and SE programs, they earn significantly lower scores when attending TT programs compared to White ELs.

With respect to the disability category, whereas SI students consistently outperformed other students in various disability categories, in the PSM match sample, it was OH students who outperformed their peers. Students classified with OH impairments

earned significantly higher Math scores overtime compared to the other categories. In addition, we see the EI continued to benefit from the additional support of the extra teacher in the classroom. In the GE setting, EI students earned significantly lower scores compared to the other groups, which is consistent with the full sample. No significant differences were noted in the SE program, however EI students performed significantly better than both LD and SI students in mathematics when attending the TT programs. Furthermore, though no significant differences were found when attending SE programs in the full sample, significant difference were noted in the PSM sample between SI and LD students. SI students tended to perform significantly better.

Statistical ELA Modeling Results. When it comes to the propensity matching sample (Gened vs Coteaching), there were very few significant factors with the final reduced model. The significant factors are as follows: Asians performed better than Hispanics. General education students performed better than Co-teaching students. Though Asian students in the GE programs performed significantly better than Hispanics, there are were no significant differences in the TT programs. In addition, OH students in the Gened programs performed significantly better than SI and LD students, whereas there were no significant differences in the co-teaching programs nor SE programs. With respect to the Coteach vs. Sped sample. Here we see that females perform significantly worse. The interaction of time and program was not significant, nor was the interaction of time and disability.

Appendix B

Case Processing for GE and TT Group

Case Processing Summary for GE & TT Group

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	1835	95.7
	Missing Cases	83	4.3
	Total	1918	100.0
Unselected Cases		0	.0
Total		1918	100.0

a. If weight is in effect, see classification table for the total number of cases.

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	ela_2006	49.380	1	.000
		math_2006	48.515	1	.000
		sex(1)	.187	1	.666
		ethnicity	6.741	4	.150
		ethnicity(1)	.088	1	.767
		ethnicity(2)	2.566	1	.109
		ethnicity(3)	.115	1	.734
		ethnicity(4)	1.904	1	.168
		disability	6.019	3	.111
		disability(1)	3.093	1	.079
		disability(2)	5.063	1	.024
		disability(3)	.000	1	.986
		poverty(1)	.936	1	.333
	Overall Statistics		74.235	11	.000

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	ela_2006	.008	.002	16.546	1	.000	1.008
	math_2006	.008	.002	15.313	1	.000	1.008
	sex(1)	-.030	.101	.089	1	.765	.970
	ethnicity			4.140	4	.387	
	ethnicity(1)	-.304	.253	1.442	1	.230	.738
	ethnicity(2)	-.186	.151	1.510	1	.219	.831
	ethnicity(3)	.011	.282	.001	1	.970	1.011
	ethnicity(4)	-1.659	1.173	2.001	1	.157	.190
	disability			3.789	3	.285	
	disability(1)	.435	.280	2.406	1	.121	1.544
	disability(2)	.532	.284	3.509	1	.061	1.703
	disability(3)	.501	.518	.938	1	.333	1.651
	poverty(1)	.045	.126	.125	1	.724	1.046
	Constant	-10.272	1.429	51.665	1	.000	.000

a. Variable(s) entered on step 1: ela_2006, math_2006, sex, ethnicity, disability, poverty.

Case Control Matching Statistics

Match Type	Count
Exact Matches	29
Fuzzy Matches	616
Unmatched Including Missing Keys	483
Unmatched with Valid Keys	436
Sampling	without replacement
Log file	none
Maximize Matching Performance	yes

Appendix C

Case Processing for TT and SE Group

Case Processing Summary TT & SE Group

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	2039	93.4
	Missing Cases	145	6.6
	Total	2184	100.0
Unselected Cases		0	.0
Total		2184	100.0

a. If weight is in effect, see classification table for the total number of cases.

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	ela_2006	243.862	1	.000
		math_2006	234.250	1	.000
		sex(1)	10.857	1	.001
		ethnicity	22.038	4	.000
		ethnicity(1)	.651	1	.420
		ethnicity(2)	11.420	1	.001
		ethnicity(3)	.095	1	.757
		ethnicity(4)	5.120	1	.024
		disability	49.642	3	.000
		disability(1)	21.642	1	.000
		disability(2)	2.483	1	.115
		disability(3)	40.154	1	.000
		poverty(1)	.743	1	.389
	Overall Statistics		378.043	11	.000

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	ela_2006	.020	.002	88.894	1	.000	1.020
	math_2006	.019	.002	77.523	1	.000	1.019
	sex(1)	-.360	.108	11.148	1	.001	.698
	ethnicity			8.113	4	.088	
	ethnicity(1)	-.603	.290	4.305	1	.038	.547
	ethnicity(2)	-.432	.184	5.505	1	.019	.649
	ethnicity(3)	-.039	.322	.015	1	.903	.962
	ethnicity(4)	20.858	22752.357	.000	1	.999	1143953046.000
	disability			46.064	3	.000	
	disability(1)	.512	.270	3.596	1	.058	1.668
	disability(2)	.107	.275	.151	1	.697	1.113
	disability(3)	-1.794	.456	15.496	1	.000	.166
	poverty(1)	-.074	.136	.293	1	.588	.929
	Constant	-24.483	1.527	256.972	1	.000	.000

a. Variable(s) entered on step 1: ela_2006, math_2006, sex, ethnicity, disability, poverty.

Case Control Matching Statistics

Match Type	Count
Exact Matches	44
Fuzzy Matches	415
Unmatched Including Missing Keys	331
Unmatched with Valid Keys	295
Sampling	without replacement
Log file	none
Maximize Matching Performance	yes

Appendix D

Request Letter and Permission Letter

Data Request #: 587-NYC

NON DISCLOSURE / NON USE AGREEMENT
FOR EVALUATION OF DOE SPONSORED PROGRAMS

This agreement ("Agreement") is dated **August 11, 2016**
between
The Board of Education of the City of New York with an address at
52 Chambers Street, New York, New York 10007 ("BOE")
And
Teachers College ("Recipient") with an address at **250 Franklin Street, Melrose, MA 02176**

The parties agree as follows:

"Confidential Information" means any personally identifiable information related to BOE students, student families/guardians, BOE employees, agents and/or volunteers obtained by or furnished to the Recipient; all findings, analysis, data, reports or other information learned or developed and based thereon, whether in oral, written, graphic, or machine-readable form; and all information marked "confidential." Confidential Information includes, but is not limited to, names, addresses, contact information, school or school attended, school district, grades or other reviews, credits, scores, analysis or evaluations, records, correspondence, activities or associations, financial information, social security numbers or other identifying numbers or codes, date of birth or age, gender, religion, sexual preference, national origin, socio-economic status (including free/reduced lunch status), race, ethnicity, special education status, or English Language Learner status; regardless of whether such information was disclosed prior to, concurrent with or subsequent to this Agreement. "Confidential Information" shall not include any information that is: **(i)** lawfully in the public domain at the time of receipt or which lawfully comes into the public domain thereafter through no act of the Recipient in breach of this Agreement, **(ii)** demonstrated to have been known to the Recipient prior to disclosure by or through the BOE, **(iii)** disclosed with the prior written approval of the BOE, **(iv)** demonstrated to have been independently developed by the Recipient without reference to the Confidential Information, **(v)** disclosed to the Recipient by a Third Party under conditions permitting such disclosure, without breach of this Agreement, and/or **(vi)** disclosed as required by court order, subpoena, other validly issued administrative or judicial notice or order and/or as a matter of applicable law, ***provided***, ***however***, that in the event disclosure is required of the Recipient under the provision of any law or court order, the Recipient will **(a)** promptly notify the BOE of the obligations to make such disclosure sufficiently in advance of the disclosure, if possible, to allow the BOE to seek a protective order, and **(b)** disclose such Confidential Information only to the extent allowed under a protective order, if any, or necessary to comply with the law or court order.

In furtherance of the **Effectiveness of instructional Programs Designed to Serve English Learners in the NYC Schools with an Educational Disability: Variation by Ethnicity/Home Language, School Language Program Type, and Disability**, the BOE agrees that from **August 11, 2016 to August 11, 2018**, Recipient shall have access to the BOE's Confidential Information as set forth in the attached Scope of Work. The Recipient agrees to hold the Confidential Information in strict confidence and not to disclose Confidential Information to any third parties nor make use of such Confidential Information for the benefit of another or for any use other than the Evaluation as set forth in the attached Scope of Work. Recipient agrees not to sell, license or distribute the Confidential Information.

The BOE shall have the right at its sole discretion to terminate the Recipient's access to the BOE's Confidential Information upon fifteen (15) days written notice to the Recipient. The BOE shall have the right at its sole discretion to terminate the Recipient's access to the BOE's Confidential Information immediately upon the Recipient's breach of any confidentiality obligations herein. No claim for damages will be made or allowed to the Recipient because of said termination. Notwithstanding anything to the contrary, the confidentiality obligations of the Recipient under this Agreement shall survive any termination of this Agreement.

Recipient shall only disclose the Confidential Information to its employees, agents or subcontractors who need to know the Confidential Information and in those instances only to the extent justifiable by that need (collectively referred to as "Personnel"). The Recipient shall ensure that all such Personnel comply with the

terms of this Agreement. The Recipient shall neither retain nor incorporate any of the Confidential Information into any database or any medium other than may be required for the Evaluation. The BOE may audit the Recipient's maintenance of the Confidential Information for security purposes.

In addition, Recipient agrees to hold all individually identifiable information obtained, learned or developed by Recipient confidential pursuant to applicable provisions of state and federal laws, including but not limited to the Family and Educational Rights and Privacy Act (20 U.S.C. 1232g) and any applicable regulations promulgated thereunder. Recipient understands that the release of Confidential Information to persons or agencies not authorized to receive such information is a violation of United States federal law. Student records shall at all times be subject to BOE policy and the Chancellor's Regulation A-820 entitled, "Student Records: Confidentiality, Access, Disclosure and Retention," (available on the BOE website at http://docs.nycenet.edu/docushare/dsweb/Get/Document-44/A-820.pdf).

The Recipient shall submit to the BOE all data collected pursuant to this Agreement. Whenever required by the BOE, the Recipient shall promptly surrender (or destroy at the direction of the BOE if surrender is not practicable) all Confidential Information and all media containing the same to the BOE and certify, in writing, that all of the foregoing materials have been surrendered or destroyed in accordance with this Agreement.

All reports and work product created pursuant to this Agreement by the Recipient and in accordance with the Scope of Work will remain the exclusive property of the Recipient. Any reports or work product may not contain any personally identifiable information. The Recipient shall provide the Chancellor or his designee with a reasonable opportunity to review and comment prior to the Recipient's publication of the results of its participation or findings in the performance of this Agreement. Five true copies of each publication or final report which includes any results of the Recipient's participation or its findings in the performance of its work under this Agreement shall be furnished to the BOE without charge, and the BOE shall have an irrevocable, nonexclusive, nontransferable, royalty-free license to reproduce, distribute, create derivative works based upon, or otherwise use the materials for BOE purposes.

The parties agree that money damages would be an insufficient remedy for breach or threatened breach of this Agreement by Recipient. Accordingly, in addition to all other remedies that the BOE may have, the BOE shall be entitled to specific performance and injunctive or other equitable relief as a remedy for any breach of the confidentiality and other obligations of this Agreement. Moreover, the Recipient acknowledges that unauthorized disclosure of Confidential Information by the Recipient, its Personnel and agents may result in civil and/or criminal penalties under New York State and Federal laws.

The Recipient shall immediately advise the BOE, Research and Policy Support Group at 212-374-7659 or in writing if the Recipient shall learn of any unauthorized use or disclosure of Confidential Information by the Recipient, its Personnel or any third party who shall have gained access to the affected Confidential Information. Moreover, the Recipient shall be responsible, at its own cost and expense, to notify in writing all persons affected by any unauthorized disclosure of Confidential Information by Recipient, its Personnel or any third party who shall have gained access to affected Confidential Information as a result of any act and/or omission by the Recipient and/or its Personnel.

Nothing in this Agreement obligates either party to consummate a transaction, to enter into any agreement or negotiations with respect thereto, or to take any other action not expressly agreed to herein. Any subsequent agreements between the parties shall include a confidentiality obligation on the part of Recipient at least as strict as set forth in this Agreement, unless such subsequent agreement specifically references this Agreement by name and disclaims the obligation of this **Section 10** in writing. In the event a subsequent agreement fails to contain a confidentiality provision with obligations at least as strict as this Agreement, the confidentiality provisions of this Agreement shall be deemed inserted therein which shall continue to bind the parties.

The Recipient shall defend, indemnify and hold harmless the BOE and the City of New York from any and all claims brought by third parties to the extent arising from, or in connection with, any negligent acts or omissions of the Recipient and the Recipient's Personnel or any other representatives for whom the Recipient is legally responsible for, in connection with the performance of this Agreement.

No failure or delay (in whole or in part) on the part of either party hereto to exercise any right or remedy hereunder shall impair any such right or remedy, operate as a waiver thereof, or affect any right or remedy hereunder. All rights and remedies hereunder are cumulative and are not exclusive of any other rights or remedies provided hereunder or by law or equity. To the extent any provision of this Agreement is held to be unenforceable or invalid, the remainder of the Agreement shall be remain in full force and effect, and the Agreement shall be interpreted to give effect to the such provision to the maximum extent permitted by law.

This Agreement shall be governed by and construed in accordance with the law of the State of New York. The parties hereto agree to submit to the jurisdiction of the Federal or State Courts of New York City, New York. This Agreement constitutes the entire Agreement between the parties with respect to the subject matter hereof; it supersedes all prior agreements or understandings of the parties, oral or written, relating thereto and shall not be modified or amended except in writing signed by Recipient and BOE. Neither party shall assign or transfer, without the prior written consent of the other party, this Agreement. This Agreement shall inure to the benefit of the respective parties, their legal representatives, successors, and permitted assigns.

Board of Education of the City of New York

By: _____ By: _____

Name: _____ Name:_____

Title: Director
Research & Policy Support Group (RPSG)

Title: _____

Recipient Acknowledgment

State of New York }
}
County of } ss.:

On this _____ day of _____, 201__, before me, the undersigned, a Notary Public in and for said State, personally appeared one , personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the entity or individual upon behalf of which the individual acted, executed the instrument.

_____
NOTARY PUBLIC

By:_____

Name: _____

Title: _____

Appendix E

New York State Diploma Requirements

New York State Diploma Requirements					
Class of	**Local Diploma***	**Regents Diploma**	**Regents Diploma with Honors**	**Regents Diploma with Advanced Designation****	**Regents Diploma with Advanced Designation with Honors**
2012 (Entering 9th grade in 2008)	NA*	Score 65 or above on 5 Regents (English, Math, Global History & Geography, US History & Government, and Science)	Earn a Regents Diploma and achieve an average score of 90 on required Regents exams.	Score 65 or above on 8 Regents and the NYC LOTE exam.	Earn a Regents Diploma with Advanced Designation and achieve an average score of 90 on required Regents examinations
2011 (Entering 9th grade in 2007)	Score 65 on 4 out of 5 required Regents exams and 55 on 1 out of 5				
2010 (Entering 9th grade in 2006)	Score 65 on 3 out of 5 required Regents exams and 55 on 2 out of 5				
2009 (Entering 9th grade in 2005)	Score 65 on 2 out of 5 required Regents exams and 55 on 3 out of 5				
2008 (Entering 9th grade in 2004) 2007 (Entering 9th grade in 2003) 2006 (Entering 9th grade in 2002) 2005 (Entering 9th grade in 2001)	Score 55-64 on 5 Regents (English, Math, Global History & Geography, US History & Government, and Science)				
2004 (Entering 9th grade in 2000)	Score 55-64 on 5 Regents (English, Math, Global History & Geography, US History & Government, and Science)	Score 65 or above on 8 Regents (English, Math, 2nd Math, Global History & Geography, US History & Government, Science, 2nd Science, and Second Language)	Score an average of 90 on 8 Regents (English, Math, 2nd Math, Global History & Geography, US History & Government, Science, 2nd Science, and Second Language)	NA	NA
2003 (Entering 9th grade in 1999)	Score 55-64 on 5 Regents (English, Math, Global History & Geography, US History & Government, and Science)				
2002 (Entering 9th grade in 1998)	Score 55-64 on 4 Regents (English, Math, Global History & Geography, and US History & Government)				
2001 (Entering 9th grade in 1997)	Score 55-64 on 2 Regents (English and Math)				
2000 (Entering 9th grade in 1996)	Score 55-64 on 1 Regents (English)				
1999 and Prior Years	0 Regents and 6 Regents Competency Tests in Reading, Writing, Math, Global, and US History, and Science				

* The local diploma option remains for general education students who pass three Regents examinations with a score of 65 or above and two Regents examinations through an appeals process. In addition, students with disabilities who earn Regents examination scores between 45 and 64 continue to be eligible for a local diploma under the various safety net options. See http://www.p12.nysed.gov/ciai/gradreq/assessmentpathways.pdf.

** Students completing an approved 10 credit sequence in the Arts or CTE are only required to complete 2 credits of a second language and are not required to take the Regents in a Language other than English in order to receive a Regents diploma with advanced designation. However, they must still meet the requirements for the total number of units of credit (44).